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QL WORLD

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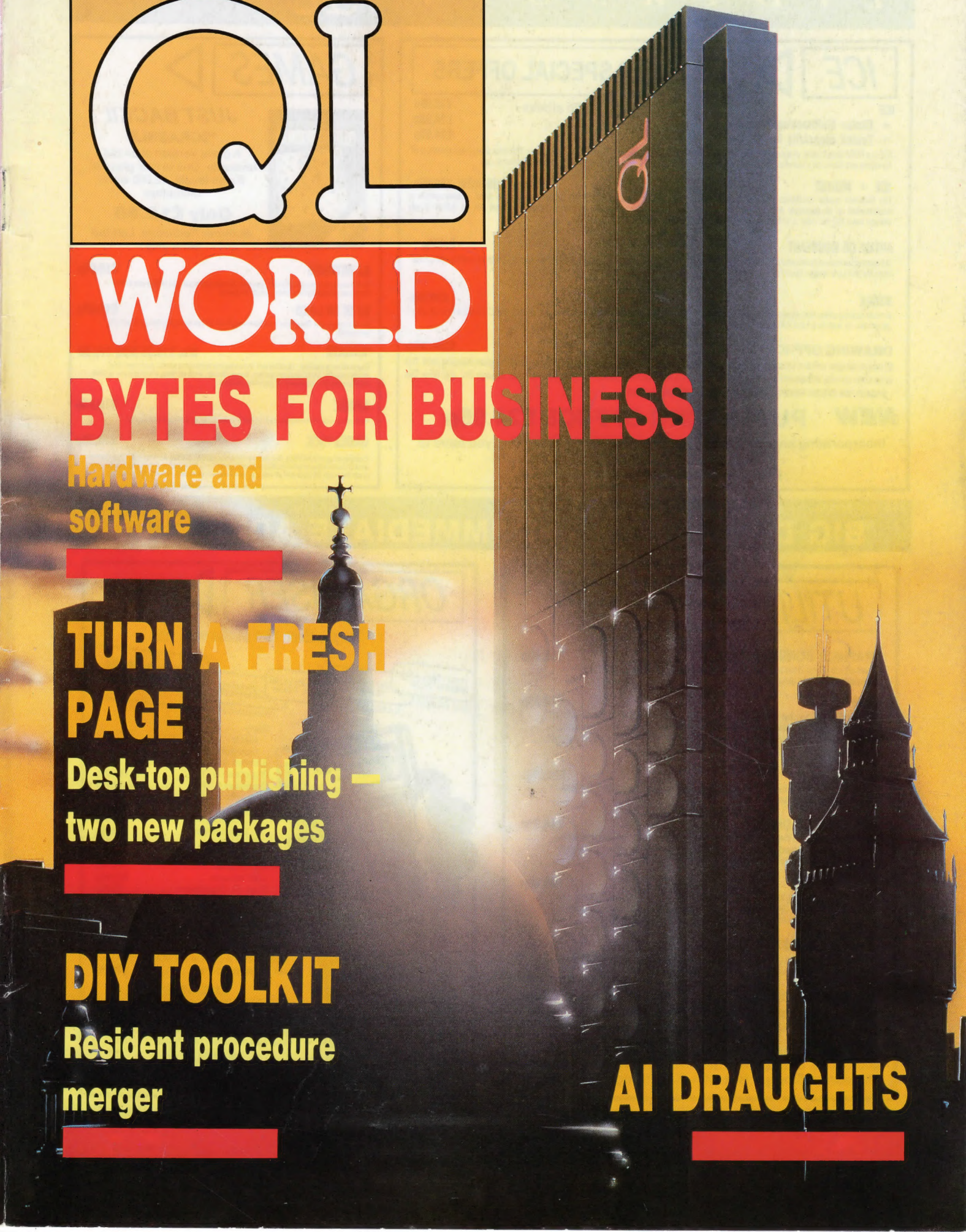

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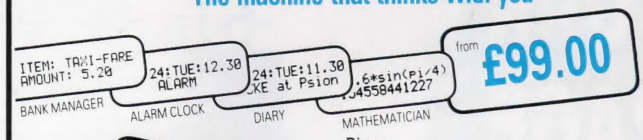

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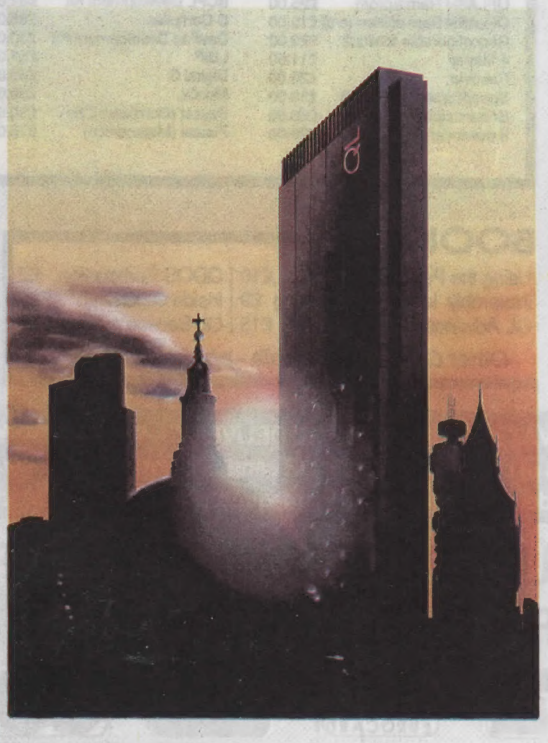

NEXT MONTH

RUMBLES ON THE HORIZON

A kite is flown into Digital Precision's new speed-up program, Lightning, to see what it is made of.

PICTURE YOUR DIGITS

Ron Massey assesses the potential — and availability — of the S.P.E.M. Video Digitalizer.

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SOFTWARE

BUSINESS

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BOOKS

Using the Psion Organiser	£10	QDOS Companion	£7
Assembly lang. Programming	£9	Inside QDOS	£20
QL Advanced Programming	£15	QL Service manual	£20

Other QL titles available - phone for details -

KEYBOARDS

Schon replacement	£45.00
Schon PC	£99.00
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QL SCENE

Faster and faster

Digital Precision is throwing its promotional weight behind a new program which the company regards as its most important for some time. Called *Lightning,* the program is described as a 'magic wand' utility which requires no technical knowledge to operate, runs silently in the background and is capable of making all QLs run up to 14 times faster.

Lightning is said to be compatible with "everything" and will work on any QL configuration, including unexpanded QLs running very large programs, and still achieve "dramatic" speed increases.

The program works by optimisation of a number of functions, among which are screen text output including ink, paper, stipples, common CSIZEs, UNDER, OVER UDGs and fat fonts, Mode4 and Mode8 graphics handling and maths functions — the latter affecting more programs than those of which the user is usually aware.

Many operations like CLS (five variants) and SCROLL are also optimised. A new "black hole" device, called "nul," has been added, and a user-extendable font library with a dozen new fonts already incorporated is included.

Installation of Lightning is fully-automated, with no BOOT editing required.

Says DP managing director Freddy Vachha: "Lightning has been a massive effort, incorporating suggestions from QJump, Sector Software, CST and many others. The team leader was Steve Sutton, an exceptional programmer who was the first person to crack the Lenslok protection system from Supercharge. Our aim was to make something which knocked spots off other enhancement programs."

Lightning retails for £29.95 from Digital Precision, 222 The Avenue, London E4 9SE.

SUB surfaces

The QL Super User Bureau is now affiliated to the British Association of Computer Clubs and is soon to take a QL area on Prestel Clubspot.

Further developments projected include a viewdata-style bulletin board for messaging, downloading of CP/M and QL public domain software, new product news and other information.

Subscription to The QL Super User Bureau is via its A5 card-covered monthly magazine; one issue of the publication is available at an introductory cost to prospective subscribers.

The QL Super User Bureau, PO Box 3, Shildon D14 2LW.

Fax organiser support software

Surrey-based software house Computext has released software for the business user and others who rely on the use of the fax organiser.

The software will print pages for any fax type organiser of any size. The program supports Epson-compatible printers and will print fax pages of the correct size on ordinary A4 paper or standard continuous computer stationery. Once the printing has been done, the sheets are cut by guillotine. Simple, six-hole perforators are available and the leaves are ready to be inserted in any personal organiser.

Compufax offers a number of useful facilities. It will print diary pages with blank lines for appointments inserting the name of the day with the date, or it will print them with appointments, if those have already been entered. It will insert all appointments for that day in time order, irrespective of the order in which they were entered.

Also it can hold names, addresses, telephone numbers of contacts and print them out on fax paper, ready to insert into the organiser. The names/addresses section has extensive search facilities and it will even print the appropriate details on an envelope. The software operates with the unexpanded QL, as well as all memory expanisions and 3.5in. discs.

Both the Microdrive and 3.5in. disc versions of Compufax are avilable for £19.95 including postage, packing, VAT and a manual from Computext, 58 Castle Drive, Horley, Surrey, RH6 9DE. Tel: 0293 776683.

The new KBL 28 extension casing for the QL.

The case of the longer QL

QL users with 4ft. long QLs and the enthusiasm to match may appreciate the KBL 128 QL casing by Schön. It houses the QL circuit board, disc drives, disc interface, memory expansion and power supply.

The KBL 128 is being sold as a DIY kit and should be attempted only by those who are confident in this area. The exterior of the unit is made of strong ABS plastic and inside there is a black steel framework. For more detailed information, contact Schön.

To overcome the problem of the extra length created by the QL expansion port, Schön also supplies a 64-way flexi-cable to reverse any add-on back on top of the QL circuit board.

The Schön KBL 128 costs £50 including VAT and carriage. Further details from Schön PCP, 15 Northcote Crescent, West Horsley, Surrey KT24 6LX. Tel: 04865 3836.

OPEN CHANNEL

Open Channel is where you have the opportunity to voice your opinions in *Sinclair QL World*. Whether you want to ask for help with a technical problem, provide somebody with the answer, or just sound off about something which bothers you, write to: Open Channel, Sinclair QL World, Greencoat House, Francis Street, London SW1P 1DG.

Quill emulator

One feature which Quill lacks is the ability to save parts of documents for subsequent inclusion in future documents. It is possible to emulate this facility as follows:

1) Place page markers either side of the text to be saved. (F3 O P).

2) Print the desired part of text to a file. When prompted with 'whole' type in the page number(s) to be saved. If the text to be saved is only one page, type the page number as the first and last page required. When prompted with 'printer' type-in the desired file name and add the extension —exp. to prevent Quill adding —lis which would render the file inaccesible to Import.

Quill will 'print' the desired text to a file with the extension —exp which will be able to be Imported.

3) To merge the desired file use the Import command. (F3 O F I), placing the cursor at the position where the imported text is to be inserted.

Because of the way the Import command works the margins will have to be reset if the imported text is altered. That is a small price to pay for a very useful additional command.

The only problem I encountered is that occasionally spurious characters may be added to the imported text. I find that removing the Quill Microdrive from mdv1— before printing the document to a file resolves that problem.

Peter Forbes,
Loughborough,
Leicestershire.

Peek puzzle

I would like to expand my QL but find the glittering array somewhat confusing and advertisments assume a full knowledge of the technical jargon and abbreviations. This point stands as well for the articles, many of which are on my shelf unread. It is the feeling of being out of my depth which has prevented me taking a regular subscription.

Information on toolkits, compilers, and editors as well as the myriad other wonders available could be the basis of a column — how do you poke or peek?

Stuart Wilkie,
Hadfield,
Cheshire.

Greek appeal

I think I represent most of the 12,000 QL users in Greece — about three times more than the U.S. I want to complain about the support of the QL in Greece. I do not know if it is the fault of the local dealers or of the British QL software and hardware houses but in Greece people who have bought QLs do not use them because of the great shortage of QL software and hardware.

I have bought a *Trump Card* from Miracle Systems, making an import myself, and now I cannot find *Speed Screen* in Greece. Many programs written after 1985 are found only as illegal copies.

It is a pity many QLs here are out of order instead of working. PC Four, QRAM, Metacomco C, the last products of Digital Precision and many other programs are not found anywhere. Trump Card, Sandy Super Q Board keyboards, Thor and Sandy computers and many other products are ignored completely. I am not fanatical about the QL but I do not want to throw away my machine. I have also paid plenty buying programs, Trump Card and NEC drivers and I have many useful files and programs written in SuperBasic by me. I hope British software and hardware houses will read this letter.

Christodoulou Manolis,
Salonika,
Greece.

Contacts, please

I have just started using a 640K Sinclair QL but I have found that I have no contact with other QL users or user groups in my area. I would be interested to hear from any QL users who are interested in games and the more serious side of QL software. Should any other users be in the same position, please get in touch.

M. Simcock,
Hillend,
Westhorpe,
Craven Arms,
Shropshire,
SY7 9LH.

Editor's notebook

This month, Leslie Fahidy embarks on a prolonged tour of the sources of hardware and software for QL business users. It is estimated that up to 40 per cent of QL owners use their machines in a business context, often in a pivotal role such as maintaining customer mailing lists or issuing invoices. Software for business users is being developed regularly, and the QL's internal power means that it can be extended to virtually any kind of office use.

While Leslie cannot undertake to answer queries personally, questions and suggestions received during the course of the series will be followed up wherever possible. We will try to make the issues under scrutiny as live as we can.

The fourth part of Marcus Jeffrey's A.I. Draughts is in this issue, with a fifth part wrapping up the series to follow shortly. If there is enough demand for a ready-made package, we may issue the whole program on the Microdrive Exchange. Let us have your opinion.

Finally, I hope to have more long programs on the Microdrive Exchange within a month or two. That should come as good news to authors who have been waiting some months for publication.

QL SCENE

More Archives come out of the Ark

ARK Distribution has announced an addition to the QL software range. *Archivist MP* is a flexible, Archive-based information manager which can be customised to suit a variety of applications.

The program is aimed at high capacity *dBase* 3-type users who wish to make the most efficient use of the QL memory by loading short indices which are then used to access database records held on floppy or Winchester discs. Up to 20 files can be managed at one time and they can be of identical or different record formats. The maximum program capacity is 200,000 unordered records, though current QL hardware — *Trump Card* — will handle only around 120,000.

Logical menu structure offers single keypress access. Using the latest Psion Archive run-time module, the system achieves full Archive compatibility in screens, databases and export files. Users who require more specialised routines can program their own using the Archive development package *Archdev* or Thor Archive.

The multi-file manager allows switching between files, linked location facilities and seamless find and search routines. The system is fully database and export file compatible with QL Archivist 128, ICL OPD Archivist, and the planned IBM PC Xchange Archivist system.

Archivist MP runs on expanded QLs and can be ordered directly from ARK Distribution, Corve Farmhouse, Chale Green, Ventnor, Isle of Wight, PO38 2LA. Tel: 0983 79 496, priced £39.95 (U.K.), £41.95 (Europe) and £43.95 (world by Swiftair plus £2).

Users gather for symposium

QL experts assembled before a gathering of 150 committed QL users at Aston University faced a barrage of questions about all aspects of the future of the QL. Advertised as a grand teach-in, the informal symposium organised by the QL Advisory Group featured displays of software from a number of suppliers.

QLAG is aimed at QL owners who perhaps do not belong to a user group but who would appreciate help, advice and counselling. The appeal to software houses was the chance to deal face to face with customers. Many apparent shortcomings of programs were due to misunderstanding of the instructions or even failing to read them.

"We would have considered an attendance of 60 as being a success," said organiser John Silk of PDQL, "so it is very pleasing to see more than 150 QL enthusiasts. People travelled from Glasgow, Kent and South Wales to Birmingham.

In the eight hours of the symposium visitors watched demonstrations of a variety of software, from Dave Henderson's smart little *SuperTrace* program for tracking elusive bugs to the huge Digital Precision Turbo compiler utility.

Sector Software attracted a great deal of interest with the leading products from its stable, including the *Spellbound* spelling checker, the powerful *Taskmaster* memory management utility for expanded QLs, and the new *Flashback* database.

Next to the Sector display area was visible proof that the QL was still worth talking to in the guise of *Kermit* — the cross-format file transfer program more often seen on Unix systems.

PDQL concentrated on its highly-regarded *Cash Trader*, giving valuable tutorials and problem-solving sessions to existing owners as part of its policy of giving full after-sales support.

Chas Dillon demonstrated the latest enhancements to *The Editor* which add a number of word processor facilities to what was originally more of a text editor. Simon Goodwin, his collaborator on the Turbo project, was able to show off the impressive claims for *Speedscreen* by producing blindly fast text displays.

Digital Precision demonstrated *Eye-Q and Turbo* and some of its plans informally. Freddy Vachha proved his intimate knowledge of DP products during a quick-fire question-and-answer session.

The focal point of the meeting was the chance for the audience to put questions of general interest formally to a panel of QL luminaries. Early questions revealed that there was a great deal of enthusiasm for the QL and its software base.

The lack of an identifiable upgrade path and the absence of new QLs were seen as central problems to the future of the market as a whole. Sadly, no hardware suppliers were present to answer the criticisms on disc systems and memory expansion units.

Questions asked by the panel revealed that all but 15 percent of those present had expanded QLs and were committed multitaskers. A surprisingly high 30 percent used their QLs primarily for business purposes. Support for *Sinclair QL World* was wholehearted.

I asked Silk about his plans for the future. "This has been too much of a success not to repeat it, probably somewhere else other than Birmingham," he said.

Thor can read

DiscOVER is a long-awaited utility which at last enables the QL or Thor user to read text or data files produced in an alien format. IBM, CP/M and BBC format text or data files could hitherto be copied over to the QL only with a specially-made cable connecting the two machines.

Now DiscOVER, available on 3.5in. or 5.25in. discs, not only converts both from and to the QL but also converts file names so that they are compatible with the destination format. An optional symbol translate feature has been incorporated in the program.

DiscOVER is available in the U.K. at £29.50 from PDQL, Unit 1, Heaton House, Camden Street, Birmingham B1 3BZ. Tel: 021 200 2313. DiscOVER is being marketed jointly with Dansoft, to which European enquiries should be addressed at 15 DK 1057 Copenhagen, Denmark. Tel: 45(01) 930347.

LIGHTNING

NEW!

LIGHTNING is very different from every other one of Digital Precision's 'serious' programs, in that it requires no technical knowledge of any sort whatsoever to operate. LIGHTNING is designed to make your QL go faster - a lot faster - when running all your favourite programs and utilities, and while performing all the tasks you set it. Remember that fast new computer you've been promising yourself? Buy LIGHTNING instead. Your QL won't feel the same again.

If you are sceptical as to how this can be done, here is our secret. LIGHTNING does its magic by automatically (and transparently - you have no indication that anything unusual is going on other than the greatly enhanced speed of your QL) intercepting a significant number of accesses to the QL's operating system, and rerouting program control to new, highly efficient and superlatively fast machine code routines of our invention. Why didn't Sinclair include such routines in the first place? We don't know, but a very hurried development schedule for the QL was probably the cause.

LIGHTNING enhances three areas of QL operation - text handling, graphics and mathematical functions. In doing so LIGHTNING does not improve the application programs you choose to run on your QL - it improves the QL itself! Because of this, LIGHTNING isn't specific to any family of software or activity: it accelerates everything.

Before we explain how substantial are the benefits that LIGHTNING affords, it is sensible to reassure you that no technical expertise whatsoever in programming is required to install LIGHTNING. We have taken a great deal of trouble to produce an omniscient and benevolent configuration program, which allows you to transfer all of LIGHTNING - or whichever bits of LIGHTNING you want - on to your application media. This transfer is a one-off process - once LIGHTNING is loaded on a cartridge or disk, you can forget all about it - it will install itself automatically and instantly when you boot up your system. The configuration program is designed to be used by absolute monkeys: it requires only the identification of the Enter key (you know, the reverse-L shaped key on the right of the keyboard), the pressing of the key a few times (when asked) and nothing more. We are not being patronising: we simply acknowledge that many users do not want the hassle of long-winded installation (remember all the grief that printer driver gave you?) and may be so deterred by a complex setting-up process that they don't get around to using the software at all. With LIGHTNING, this won't happen.

Digital Precision always caters for knob-twiddlers too. The configurator allows a great deal of customisation for those who despise 'vanilla' settings. It's there if you want it!

The benefits bestowed by LIGHTNING are considerable - let's look at improvements to text output first. All output to the screen in the universally used character sizes 0,0 and 1,0 is accelerated by a factor which ranges from 2.6x to 14x (depending on your hardware and how you set up your test). LIGHTNING caters for all sizes, positions and alignments of windows and consoles, all ink colours (including stipples), all paper/strip colours (including stipples), all conditions of OVER and UNDER, all fonts (including so-called fat ones) and all graphic characters and UDGs (the whole range from CHR$ 0-255).

As a consequence, cursor movement, screen-housekeeping, window clearing, panning and scrolling (and all their variants) are all made much more zippy and responsive - and feel much smoother. Interaction with a computer is a largely psychological thing - and LIGHTNING makes you love your QL. That which used to drag on interminably now happens instantly. Even Quill becomes bearable - rescue it from your dustbin! Needless to say, that which was fast in the first place - like Editor - now becomes positively breathtaking.

The full version of LIGHTNING occupies about 21K, and is hence usable on all QL configurations - expanded or not. If you have an application where every K counts, an even more concise version of LIGHTNING is supplied (together with the full version) - it occupies under 4.5K and offers virtually all of the speed and facilities of its bigger brother.

In addition to its accurate mimicry and enhancement of QDOS, LIGHTNING includes some brand new features: amongst these is a new device, called 'nul', an insatiable black hole which can greatly simplify the construction of many programs. For example, the option to output to a printer can be taken care of in just one line of code, rather than by including an IF test with each PRINT statement.

In order to reduce the time taken to scroll, LIGHTNING both speeds up the very act of scrolling itself and also allows a modification to the way window scrolling works. If, when the window is scrolled, everything is moved up by (say) ten lines, instead of one, there will be room at the bottom of the window for ten lines of printing. A more important consequence is that scrolling will then only happen a tenth as frequently as before. The result of this will be that the overall printing rate will be greatly increased.

LIGHTNING provides another special feature that is useful when large amounts of text are being output to the screen, as well as in other situations. This is the output 'drain' feature. This simple control works as follows: If at any time you press a preselected key you will find that no further character output to the screen will occur at all! Any program or command that attempts to output text is not stopped, though: it is just that the text output is poured down a drain by LIGHTNING. Since no output is performed (the drain simply gobbles stuff up at an alarming rate - 100x over BASIC) the effective speed of the program is much greater. By pressing a key you can re-activate screen output.

Whenever commands such as MODE, NEW and RUN are encountered, QDOS will clear all the windows currently open to the screen. During MODE, it will also reset certain information in the header table for each channel open to the screen so that the correct character attributes and colours are set up. All this often takes a long time. LIGHTNING will happily duplicate this process. However, you can also arrange for LIGHTNING to disable this (sometimes excessive) housekeeping - you will then benefit from further speed improvement.

Twenty two new and elegant fonts are supplied with LIGHTNING, together with a smart font loader. You can use any of these fonts on any or all of the programs you run - you need no knowledge of them - and swop fonts at will.

DIGITAL PRECISION

But enhancing text output is not all that LIGHTNING can do. LIGHTNING accelerates many of the standard graphics commands, both in MODE 4 and in MODE 8. In particular, the commands for POINT, LINE and CIRCLE and all their variants are improved. In addition, the FILL 1 setting (for which graphics are performed with area filling enabled) is faster too, and certain problems inherent with the QDOS implementation of it are corrected. Note that we are as wary of indiscriminately fixing "bugs" in the QL ROM with LIGHTNING as we were while producing our compilers - the reason for our wariness is that many programmers rely on ROM quirks for their programs to work - so if we fix the quirk, their programs stop working!

The speed improvement achieved over the native QDOS graphics routines varies from better than 6x improvement for point plotting to a 50% improvement for circles.

The mathematical enhancements work on any SuperBASIC program, including programs compiled with any of the SuperBASIC compilers currently available, and any other program (in any language) that uses the QL's name table . As is usual with LIGHTNING, you need no knowledge whatsoever of the program's workings to benefit from LIGHTNING's effect. A vast range of programs use these functions - far more than you imagine. Our own Editor does so!

When installed, the following functions are all speeded up: EXP / LN / LOG10 / SIN / ASIN / COS / ACOS / TAN / ATAN / COT / ACOT / SQRT

Note that the speedup is achieved without any appreciable change in precision (for some functions we are more accurate, though QDOS is pretty much spot-on most of the time). Your programs will hence operate as before, albeit faster. How much faster? A doubling in speed is par for the course (we get back to hardware differences again). Things don't stop there, though. For most jobs there is no need to use maths functions to the full precision provided by the QL (and LIGHTNING). For example, trigonometric functions are often used when constructing drawings and designs, say for 2D and 3D packages, CAD and so on. In most of these cases the value of one or more trigonometric function is used to work out where a point should be plotted on a single screen. Since the resolution of the QL's screen is only 1 part in 512 (at best), only the first 3 digits or so of the value contribute towards screen position in many of the cases. For this sort of application, you can instruct LIGHTNING to calculate all the above functions to less precision. This has the advantage of increasing speed quite dramatically. Precision can be varied from outside the application program, of whose workings you need no knowledge.

Valid precisions include 4 for the full quadruple byte precision (the default situation when the LIGHTNING maths routines are first installed), 2 for double byte precision (providing approximately 4 significant digits of precision, the same as log tables, and sufficiently accurate to put a man on the moon if we believe NASA's anecdotes) and 1 for single byte precision. This last setting provides an extremely fast (10x over BASIC is par for the course) result, but it is only accurate to about 2.5 significant digits. The use of this last setting must therefore be treated with some care, as problems might result from programs where the result of one calculation provides the input to the next - accumulated errors might become large. In any event it is sensible to experiment a bit with the application program if you want to use reduced precision - observe whether it makes a difference. Astrologers can turn a Hitler into a Gandhi (or vice versa) by indiscriminate reductions in precision!

Here is a list of LIGHTNING commands for those who like to fine-tune: _lngOFF / _lngON / _lngGRAF / _lngZIP / _lngDOMODE / _lngNOMODE / _lngGOOD / _lngBAD / _lngKEYSET / _lngPREC / _lngFPREC / _lngFONT .

Here is some useful information. Most of the application programs you run have been produced using a compiler. LIGHTNING refreshes the parts that even our compilers (as well as everyone else's) can't reach. But compilers refresh the parts that LIGHTNING can't reach. The consequence of this happy symbiosis is that accelerations obtained by combining LIGHTNING with a program produced with a compiler (this means virtually every program on the market) are MUCH better than multiplicative: if you can intuitively understand why this is the case, skip the next three paragraphs.

Let us say a BASIC program spends 40% of its time on actual text printing, and that the average LIGHTNING speedup for these operations is 8x (easily obtained for many common solid ink/paper combinations). Let us also say that the rest of the processing time is spent on operations that TURBO (our SuperBASIC compiler) could speed up by 20x (TURBO typically accelerates by between 10x and 100x) and on which LIGHTNING has no effect (so, no graphics or maths functions). Say T seconds was the time taken to run the program.

The time taken if LIGHTNING was used would thus be 0.6*T + 0.4*T/8 = 0.65*T seconds, yielding an overall speedup of 1/0.65 = 1.54x . The time taken if TURBO was used would be 0.4*T + 0.6*T/20 = 0.43*T seconds, yielding an overall speedup of 1/0.43 = 2.33x. If both TURBO and LIGHTNING were used, the time taken would be 0.6*T/20 + 0.4*T/8 = 0.08*T seconds, yielding an overall speedup of 12.5x .

You should note that the speedup (12.5x) of the combined TURBO and LIGHTNING is much greater than a simple product of overall speedups (2.33 * 1.54 = 3.59x) - by almost four times. Food for thought.

While on the subject of benchmarks, here is the test we used to generate the timings that appeared in our QL WORLD June 1988 ad.

```
100 REMark IMPLICIT _STRIP,STRIP1,STRIP2,STRIP3,_INK,INK1,INK2,INK3,
                                                _UNDER,_OVER,TESTLEN
110 REMark Remove the REM from the start of line 100 if you are going
                                          to compile the program with TURBO.
120 DIM TEST$(1024):TESTLEN=1
130 INK 7:PAPER 0:STRIP 0:UNDER 0:OVER 0:MODE 4:RANDOMISE 51:PAUSE 10
140 PRINT"Press Y to run test / Other key to compute test overhead"
150 FULLTEST$=INKEY$(-1):CLS:AT 19,0:PRINT "Please wait..."
160 STARTDATE=DATE
170 REPeat CHANGE_STRING
180   TEST$=""
190   FOR _OVER=1 TO TESTLEN:TEST$=TEST$&CHR$(161*RND+31.5)
200  IF NOT(FULLTEST$=="Y"):TEST$="":REMark For computing test ohead
210   FOR _OVER=-1 TO 1
220     OVER _OVER
230     FOR _UNDER=0 TO 1
240       UNDER _UNDER
250       FOR INK1=0 TO 3
260         FOR INK2=0 TO 3
270           FOR INK3=0 TO 3*(INK2<>0)
```

```
280             INK=INK1*2+INK2*16+INK3*64:INK _INK
290            FOR STRIP1=0 TO 3*(_OVER=0)
300              FOR STRIP2=0 TO 3*(_OVER=0)
310                FOR STRIP3=0 TO 3*(STRIP2<>0)*(_OVER=0)
320                  STRIP=STRIP1*2+STRIP2*16+STRIP3*64:STRIP _STRIP
330                  IF _INK<> STRIP:AT 0,0:PRINT TEST$;
340                END FOR STRIP3
350              END FOR STRIP2
360            END FOR STRIP1
370          END FOR INK3
380        END FOR INK2
390      END FOR INK1
400    END FOR _UNDER
410  END FOR _OVER
420  TESTLEN=2*TESTLEN:IF TESTLEN>256:EXIT CHANGE_STRING
430 END REPeat CHANGE_STRING
440 INK 7:PAPER 0:STRIP 0:UNDER 0:OVER 0:
450 AT 19,0:PRINT "TIME TAKEN: ";DATE-STARTDATE;" SECONDS                ";
```

The program is complicated by the fact that to make the test absolutely fair, each ink and paper combination is printed exactly once and only once (hence lines 270 and 290-310) except for cases where INK=PAPER, which we exclude (in line 330) for obvious reasons. The string comprises random characters and its length varies geometrically: 1, 2, 4, 8 and so on upto 256 (line 420).

Readers amazed at the speedups yielded by LIGHTNING which were published in the June 1988 QL WORLD should note the following:

(a) Allowing string lengths upto (say) 1024 or 2048, approximately the length of a page, instead of to 256, yields a speedup (and relative speedup) MUCH more favourable for LIGHTNING than the published one.

(b) Using strings whose length varied in arithmetic sequence - say 20, 40, 60, ..., 240 - yields a speedup (and relative speedup) MUCH more favourable for LIGHTNING than the published one.

(c) Using CSIZE 1,0 instead of CSIZE 0,0 yields a relative speedup MUCH more favourable for LIGHTNING than the published one.

(d) Changing window alignment, the frequency of occurrence of space characters and hardware influenced speedup (generally upwards) but made no noticeable difference to relative speedup.

(e) Using QLIBERATOR or SUPERCHARGE instead of TURBO decreases speedup (by only a little in the case of SUPERCHARGE) but made no difference to relative speedup.

'Nuff said. LIGHTNING costs just £29.95 and comes with a manual that is, quite simply, excellent - jargon-free, concise and lucid.

ACT SPECIAL EDITION

ACT stands for Adventure Creation Tool.

Here is a program for anyone with an enquiring mind. It is a complete system whose function is to plan, generate, write and control "adventures" - automatically. ACT does away with all the tedium associated with such activities.

If you are turned off by games in general or adventures in particular, DO NOT stop reading. ACT is a "serious" program - and our definition of an adventure is a far-reaching one, as you will see.

In an adventure, an entity moves between, explores and analyses locations that are topologically interconnected in a way selected by the designer - underlying geography may range in complexity from a simple plane to a 3D world to a non-visualisable multidimensional environment which can exist only as a mathematical abstraction. As the entity moves between locations, he interacts (this word covers every possible activity) with other entities, animate and inanimate, which obey rules, enjoy powers and possess properties delineated by the designer. Pseudo-random events may occur. There is one or more goal. The path to achieve the goal or goals is an arduous one.

Do not temper this definition of an adventure with any of your negative experiences with the (often wretched) adventure game implementations that abound. Try to free your mind from preconceptions (only too often a synonym for misconceptions). Adventures can be virtually anything you choose to make them. Your imagination is the limit. Whether you wish to use ACT to generate games or to develop serious software or to explore the unknown is up to you.

ACT takes all of the drudgery out of producing software that involves interrelated graphic (static multi-frame or animated) and/or (we do mean and/or) text output. At the same time, ACT places no restrictions on your ingenuity and creativity.

ACT is feature-packed and will be of use as a general development tool even if you are not in the least bit interested in producing or running adventure games or any sort of games at all. It is a professional software package that has a variety of applications - on-screen animation, simulations, real-time event control, psychological analysis are just a few that come to mind. You will find many other uses for ACT. If you can program (to use ACT you don't need to) you will find the control language a dream.

The architecture of ACT is flexible - any of its features can be included at any stage. There can be upto 96K messages, upto 32K message groups, upto 1.5K characters per message, upto 4K words in the vocabulary, upto 256 locations and 256 objects. Available RAM is the sole constraint on the number of flags and controls. Text formatting (including justification and word-wrap) for output is automatic - even to the extent that if text flows over a page a pause is generated! A full-feature sound editor is present. Both screen modes are supported - indeed, they can be mixed on the screen at one time! The amount of screen used for graphics can be set by the user, and can vary during an adventure. There is full control over ink and paper colours - these are even adjustable on a character to character level. Text and graphics storage is particularly efficient - factors of 2x-4x are par for the course. The graphics system can even be used by itself, as a stand-alone program. There is a screen dump routine too.

Location "pictures" can be produced and saved with ease - they typically occupy under 0.5K. Why the quotes around pictures? Because these pictures are, in fact, coded information to enable the screen to be reconstructed from a high level language. ACT will even allow you to produce SuperBASIC routines (for incorporation into other programs) which will draw screen graphics. As if that wasn't enough, animation of these pictures is supported too! To describe ACT as including a comprehensive illustrating and animating system would not be wrong.

DIGITAL PRECISION

It is important to make clear that you need no programming knowledge to use ACT. However, if you can program, you will be able to use ACT for lots of things even we haven't (yet?) thought of!

All the features of ACT are accessible from outside ACT too.

On-line debugging is available, allowing manipulation of all features of the adventure while running it (in the context of games playing, this would be called cheating - but very sophisticatedly). Single-line stepping and the setting of breakpoints are supported. ACT and all its parts fully multitask - but you guessed this already. Numerous analytical tools and utilities are provided with ACT for generating, editing and examining geography, entities and characters.

The manual is an important part of a wide-ranging program like ACT. The one we supply is comprehensive and provides a full tutorial with walk-through and a full setup. An adventure framework is supplied. A fully finished adventure (appropriately called IMAGINE) generated entirely by ACT is also provided - you would expect to pay £30 for this alone!

If you have reached this point and are still a bit unclear about what ACT does, let us simplify: Much of ACT is devoted to the generation of the adventure. The rest is devoted to the running of it. Run-time logic is controlled by two programs, one - which runs all the time - is an intelligent parser that responds to commands (accepting abbreviations, multi-statement commands etc) and the other - which runs once a second - provides control over real-time events and movements, including the generation of random happenings.

Note: ACT SPECIAL EDITION is a greatly enhanced development of APT (Adventure Programming Tool) which received a rave review in QL WORLD August 1987.

ACT is for everyone - it costs just £49.95. Get your act together and buy ACT. You will always wonder how you did without it.

TURBO v2.0

Speed: TURBO is an optimising SuperBASIC compiler, even faster than SUPERCHARGE! TURBO has a completely new, fast, super-compact library. Benchmarks never tell the whole story (say the sour-grapes specialists), but the story they do tell in TURBO's case is mighty impressive: here are the speed-up factors (TURBO vs JS QL SuperBASIC) given by the Personal Computer World benchmarks.

PCW BMs :	1	2	3	4	5	6	7	intmath	realmath
	34x	60x	40x	51x	40x	37x	41x	69x	22x

And all this on mere default settings (FREEFORM)! Change the setting to STRUCTURED on a well-written program, and these values will be further enhanced. Longer programs will show much higher speedups.

Conciseness: TURBO is a space-saver: compiled code is more concise than even that of SUPERCHARGE.

Compatibility: TURBO is compatible with the entire syntax of SuperBASIC. And is fully Thor-compatible (including THOR XVI). Any program can be compiled on any QL or THOR and will run identically on any QL or THOR. Commercially available toolkits are supported.

Multitasking: You can run any number of tasks simultaneously - all utilities for task management are supplied, including ones to list, suspend, remove, change the priority and snooze.

User-friendliness: The front end has been newly developed for maximum ease of use. If you want to optimise your program beyond what the default settings offer you, you are given control over code address size (16 or 32 bits), object code size (up to 64K or beyond), optimisation for speed or space (on a line-to-line basis if you wish), inclusion/exclusion of line numbers, diagnostics display, source format (freeform or structured), treatment of local strings, presence of QRAM and Pointer environment, number of windows to copy from SuperBASIC, filename, taskname and dataspace of the object program, buffer size, format of listing (window size and location, colours, sound, pause after errors/warnings), compiler residency.

Task communications: Pipes allow BASIC or any task to PRINT and INPUT ANYTHING through RAM to themselves or one another (temporary files - who needs them!). Plus these features unique to TURBO: Any number of tasks can share procedures and functions. Any task can both read and write variables (even arrays) in any other task. Channels can be shared between separately compiled tasks. Fast library manager included. Option strings can be passed as parameters of EXECUTE.

Instant Linking: LINKING in microseconds of any number of modularly compiled tasks - hence allowing compilation of any size of program on an unexpanded QL. If there is a change to be made to one program module, it is the only one you need to recompile! Hooking TURBO tasks up to your assembly language programs is easy too.

Virtual arrays: Arrays on disk or cartridge - dimension arrays larger than available RAM - lightning quick 'cache' buffered access.

Accuracy: Accuracy is superb - two more digits of displayed accuracy than either interpreter.

Reporting: Reporting of warnings and errors with explanation and location (line, statement, even position within statement).

Fast-loading: A 100K compiled task will load from cartridge in 18 seconds (from disk in 3 seconds).

Street Wisdom: TURBO takes interpreter bugs in its stride, with relaxed error checking. It compiles most wrongly structured programs (provided they do not crash under the interpreter). Unlike SUPERCHARGE, TURBO is not strict - it automatically mimics the behaviour of the interpreter when it finds a structural fault, and annotates the listing to describe what TURBO has done to correct the mistake.

Output code size: This is unlimited! Output code is compact, with zero library overhead - no need for separate interpreter runtimes.

Fast compilation: TURBO is much faster than SUPERCHARGE - which itself left the competition on the starting line - 108K of typical SuperBASIC compiled to 72K, parsing at the rate of 480 lines/min and code generating at the rate of 940 lines/min.

Implicit datatypes: Implicit datatypes are supported, yielding accelerated, fully re-entrant integer FOR loops (at last!) and integer/string SELECT, on all QL versions.

THE DIGITAL PRECISION AD IS CONTINUED OVERLEAF

WHEN ERROR: WHEN ERROR trapping of ANY error to a single point, or any number of local error handlers - fully hierarchical. Works on all QL versions! Error handlers have access to line and error numbers - you can then RETRY/CONTINUE to an external error handler, or restart processing as you choose.

Example programs: One hundred example programs provided on (cartridge/disk) - a full tutorial and reference guide.

Rubber arrays: Ever needed to preserve array contents on redimensioning?

Array and reference parameters: Pass both variables and arrays of any number of dimensions by 'Reference', so parameters can be used to pass values back from a procedure or function, or even to another task. 'Local' and 'value' parameters will still work fine - string value passing is much quicker than with SUPERCHARGE.

Documentation: Lucid documentation in the form of an indexed manual with 350 A4 PAGES.

Copy Protection: NO LENSLOK or similar device - TURBO is protected only by copyright law. No royalties are payable on TURBO'd programs.

Toolkit: TURBO is supplied with a supremely comprehensive toolkit, with 200 add-on commands, procedures, functions and routines. A complete list of these was published in QL WORLD December 1987 issue page 4. Facilities provided include binary random file access, move/search areas of memory at great speed, edit all types of variables on-screen, control cursors in different tasks, TYPE_in things to the keyboard directly from a program, control and interrogate tasks and devices, maintain overlapping aand pop-up windows, design fonts, synthesise sounds, profile programs to show the proportion of time each line or routines takes, string PEEK and POKE, memory management commands including a way to UNRESPR, default devices, an invaluable set of access functions to SuperBASIC system variables, compiler directives, free-RAM analysis and so on. TURBO TOOLKIT has been designed to complement existing toolkits like the Supertoolkit, with only a very small overlap of functionality.

TURBO is the result of ten thousand man-hours of very hard work. It is THE compiler for the QL. Nothing else comes even close. Read the independent and comparative reviews in the April 1987 QL WORLD and the September 1987 QL WORLD - the verdict is clear. TURBO is faster, more concise, more capable and more compatible. Don't buy another interpreter, you already have one in your QL. Buy TURBO.

SUPERCHARGE SPECIAL EDITION

SUPERCHARGE was the first SuperBASIC compiler for the QL and took every reviewer's breath away when it was launched. Digital Precision, ever alert to the possibilities of the QL, have since gone it one better with TURBO, the ultimate SuperBASIC compiler, but have now completely reworked SUPERCHARGE to produce SUPERCHARGE SPECIAL EDITION.

- SUPERCHARGE is now available without Lenslok, relying on the copy protection afforded by international copyright law.

- SUPERCHARGE has been speed-enhanced so that it now runs at a full two-thirds of TURBO's speed - 50% faster than SUPERCHARGE v1.19 .

- SUPERCHARGE will allow larger programs to be compiled without modularisation on an unexpanded QL than does TURBO (on the expanded QL, TURBO wins easily) because in terms of absolute size SUPERCHARGE itself is smaller than TURBO.

- SUPERCHARGE is now available at the ridiculously low price of £29.95, which is one- half of its previous cost.

So if you can make do with a little less power for a lot less money, or indeed if you feel ever so slightly timid about using the supremely powerful TURBO without first test-driving something less powerful, SUPERCHARGE SPECIAL EDITION will fit the bill.

THE EDITOR v1.17
THE EDITOR SPECIAL EDN v2.05

THE EDITOR is a general purpose utility program and IS NOT JUST A WORD PROCESSOR. At Digital Precision we use it in-house as a database manager and controller, accounts package, advertisement preparer - as well as a word- and text- processor. THE EDITOR is routinely used to produce our (often huge) program documentation. We could not do without it. The impossibility of using Quill for anything worthwhile drove us to write it. After producing it, we decided not to be selfish, and to share it with the world.

THE EDITOR is the most comprehensive and useful text-handling system for the QL and Thor. It will deal with:
- individual characters (including foreign and non-printing ones, inventing a hieroglyphic display for the latter);
- words (you define whether you want a particular character to be a word delimiter: this may even be different for word-search and word-wrap purposes) - THE EDITOR loves Spellbound Spelling Checker;
- lines (all the usual forms of margins, tabs and justification will be found, and a few unusual ones, too);
- sentences (e.g. if you desire more than a single space after a full stop, THE EDITOR will recognise and happily respect your wish when reforming lines);
- columns (multi-column work is supported);
- paragraphs;
- screens;
- blocks (character-, column- or line-delimited);
- pages (with visible page breaks if you choose);
- whole files (pure text documents, say programs in SuperBASIC or any other language, as well as text with control characters, e.g. QUILL documents, and pure binary files, such as machine-code programs).

Of course all the commands you can possibly expect from a text editing system are present - over 200 of them. You will find them listed on page 5 of the December 1987 QL WORLD. The most commonly used commands are available by direct keypress. In their extended form, they comprise an absurdly easy-to-use command language, thus permitting the construction of iterative command files (like macros but with knobs on) for frequently used sequences - for example automatically invoked boot-up sequences for THE EDITOR itself, or super-commands to simplify and accelerate your work.

THE EDITOR's speed is sensational: all operations are performed faster than by QUILL (see comparison chart in the above-mentioned QL WORLD) - indeed some over 200 times as fast. And if you have LIGHTNING...

DIGITAL PRECISION

THE EDITOR will happily multitask with the SuperBASIC interpreter or - RAM permitting - with any executable task. Running multiple copies of THE EDITOR is a good idea for comparing and processing different versions of the same file, or entirely different files. You can have overlapping windows for each EDITOR copy - or entirely distinct windows (so all the text on all of the windows is actually visible at the same time). You can vary character sizes and ink/paper colours to distinguish between the different EDITOR copies. You don't need Taskmaster/QRAM to multitask THE EDITOR - the program, as with virtually all of our programs unless we have a good reason to do the contrary, natively multitasks.

Throughout, EDITOR's hallmark is absolute consistency of operation (which makes it very friendly, despite the daunting number of commands!) and its philosophy of placing YOU in the driving seat, leaving it up to YOU to decide how, where and in what sequence you should accomplish your objectives, and unlike Quill, one of whose major failings was a pedantic way of imposing its own preferred sequence of commands upon you.

FEATURES	STANDARD EDITOR	Metacomco ED	QUILL
Handle Quill _DOC files	Yes	-	Yes
Accept all characters 0-255	Yes	-	-
Display all characters 0-255	Yes	-	-
Printer driving	Yes	-	Yes
Simultaneous printing/editing	Yes	Yes	-
All printer fns allowed	Yes	-	-
Restriction-free cursor move	Yes	Yes	-
Change delimiters for words	Yes	-	-
Cursor word left/right	Yes	Yes	Yes
Cursor start/end of line	Yes	Yes	-
Cursor to next truncated line	Yes	-	-
Cursor top/end of screen/file	Yes	Yes	-
Cursor to marker	Yes	-	-
Cursor to specified line	Yes	Yes	-
Cursor to next/prior para	Yes	-	Yes
Cursor to start/end of block	Yes	-	-
Cursor to last command point	Yes	-	-
Non-immediate cursor commands	Yes	-	-
Page screen forward/back	Yes	Yes	-
Scroll screen up/down	Yes	-	-
Delete char/word left/right	Yes	-	Yes
Speed independent of filesize	Yes	-	-
Delete to start/end of line	Yes	-	Yes
Delete/Un-Delete line	Yes	-	-
Define block in any sequence	Yes	-	-
Delete/Move/Copy block	Yes	-	Yes
Set marker	Yes	-	-
Find from current position	Yes	Yes	-
Replace from current position	Yes	Yes	-
Set right/left/indent margin	Yes	-	Yes
Switchable case sensitivity	Yes	Yes	-
Set tabs - regular+asymmetric	Yes	-	Yes
Remove tabs	Yes	-	-
Expand tabs	Yes	-	-
Compress tabs	Yes	-	-
Justify left/right	Yes	-	Yes
Justify centre/middle	Yes	-	-
Paragraph reform (selective)	Yes	-	-
Overstrike/insert mode	Yes	-	Yes
Case translate - to UPPER	Yes	-	-
Case translate - to lower	Yes	-	-
Case translate - to Mixed	Yes	-	-
Word wrap	Yes	Yes	Yes
Move block	Yes	-	-
Retain definition of block	Yes	-	-
Sequence file on cols a to b	Yes	-	-
Renumber program lines	Yes	-	-
Undo current line editing	Yes	Yes	-
Issue multiple commands	Yes	Yes	-
Recall last commands	Yes	-	-
Issue repeat commands	Yes	Yes	-
Repeat last commands	Yes	Yes	-
Dynamic memory management	Yes	-	Yes
Memory status display	Yes	-	-
On-line help	Yes	-	Yes
Switchable Page-break display	Yes	-	-
Dynamic speed adjustment	Yes	-	-
Multitasking	Yes	Yes	-
Range of available colours	Yes	-	-
Adjustable window size/posn	Yes	Yes	-
Range of character sizes	Yes	-	-
PROCESS COMMAND FILES	Yes	-	-
FULLY CONFIGURABLE BY USER	Yes	-	-
SPECIAL FONTS	Yes	-	-
HANDLE ANY FILE(ASCII OR NOT)	Yes	-	-
INSTANT RESPONSE TO KEYBOARD	Yes	-	-

There are dozens of default settings for you to ignore if your needs needs are simple, or else to alter either semi-permanently with a user-friendly configurator or ad hoc from within THE EDITOR at run-time. Among these defaults are screen size and position, character size, start-up modes and margins, maximum line length, the cursor column position for horizontal scrolling to occur, the maximum number of simultaneous search strings examined AND-wise or OR-wise, etc.

Like THE EDITOR itself, the printer driver that comes with it beats all records for versatility. You can adapt it to your every need, e.g. for multi-line headers and footers, flexible page-numbering, control characters to permit every font and every type of special effect your printer can handle. At incredible speed: and need we add that while printing you can continue editing?

THE EDITOR comes in two sizes: v 1.17 STANDARD EDITION for all QLs and v 2.05 SPECIAL EDITION with extra power through 80 additional commands for Thor computers and QLs with at least 128K RAM expansion.

Each version has its pellucidly clear and comprehensive manual, including a detailed Index, and its meticulously laid-out help screens. In their review of THE EDITOR, QL WORLD's technical reviewer concluded that he had "seldom encountered a program which positively scintillates with due care and attention to program flow and function as with THE EDITOR". From all the superlatives reviewers have heaped upon this program, this comment is the most revealing. It is that intangible "feel" that makes THE EDITOR not just another excellent program, but instead a truly great one. ST/AMIGA/ARCHIMEDES owners, eat your hearts out - you can't have it.

DESKTOP PUBLISHER
DESKTOP PUBLISHER SPECIAL EDN

DESKTOP PUBLISHER is a comprehensive desktop publishing system for any QL with at least 256K expansion RAM. An even faster and user-friendlier SPECIAL EDITION DESKTOP PUBLISHER for QLs with at least 512K of RAM and a disk drive is also available, as is an equally powerful variant for the Thor. Either will extend the power of DESKTOP PUBLISHER far beyond anything available for computers well above the QL's price bracket. Here is an overview of the features of both program versions (x = feature supported):

	DTP	SPECIAL DTP
Total user control	x	x
WYSIYWYG	x	x
Integral graphic fonts	12	12
Integral text fonts	8	21
Any combination of fonts possible in single text		x
Easy changing of characters within loaded text		x
Non-integral text fonts	10	
Integral graphic symbols	150	150
Integral paint-brush shapes	160	160
Filling textures		>7000
User-defined textures		unlimited
Inversing, inverting and mirroring of textures		x
Decorative fonts	x	x
All fonts stretchable and squeezable in both x and y directions	x	x
Redefinition of foreign character sets possible		x
Auto borders and margins	x	x
All proportions redefinable at pixel level	x	x
True descender editing (separate descender files)	x	x
Merging with AND, OR, XOR	x	x
Colour reversal	x	x
Mirroring	x	x
Switchable grids and rulers	x	x
Up to 15 x zoom	x	x
Stipples	x	x
Stripes	x	x
Rotation	x	x
Importing of files from THE EDITOR, QUILL etc.	x	x
Importing of screens, part screens and compressed screens from EYE-Q and other graphics programs	x	x
Importing of pages designed with FRONT PAGE		x
Freehand drawing with unrestricted mixing and overlapping of text	x	x
Cut and paste	x	x
Selective save	x	x
Saving of screens - not just pages (useful with EYE-Q)		x
Hierarchical escape	x	x
Drawing area in pixels	960x800	960x800
Pages in memory with less than 512K RAM	1	N/A
Pages in memory with 512K RAM or more	2	2
Different page sizes for A3, A4, and A5 pages		x
Windows larger than visible screen up to page size		x
Optimizing auto character sizing of incoming text with manual override		x
Auto-hyphenation of incoming text		x
Loading of both text and 16x16 fonts across any area up to the whole page in one go		x
Inversing, inverting and mirror imaging of whole page		x
Max. lines	80	80
Max. columns	160	160
Wildcard directory with auto pause		x
All commands selectable both by single keypress and by menu bar		x
Device independence	x	x
Epson-compatible output	x	x
Larger page sizes for MX80-type printers		x
Upright or sideways printing	x	x
8x8 UDGs	x	x
16x16 UDGs	x	x
Integral font editor	x	x
Routines for drawing lines, arcs, ellipses		x
Integral graphics generator	x	x
Pixel-based left, centre and right justification	x	x
User-selectable word-wrap and justification		x
User-selectable percentage of line to be filled		x
User-selectable maximum gap (in pixels) between words		x
Pixel-based or character-based movement	x	x
Cursor-dragged user-defined boxes	x	x
Pop-up menus	x	x
Cursors	4	4
Underline styles	4	4
Underlining and inversing of individual words		x
Bold	x	x
Left and right italics	x	x
Multiple justification possible	x	x
Justification of 16x16 fonts		x
Variable linefeeds	x	x
Separately controlled panning/scrolling of screen, window and contents	x	x
Cameo for overview	x	x
Direct entry of text with many editing commands	x	x
Full compatibility with THE EDITOR	x	x
Full compatibility with QUILL _lis and _doc files		x
Translation tables for control characters in text		x
Clip art	x	x
Capslock indicator	x	x
Context-sensitive help	x	x
Undo facility available in most modes		x
Full multitasking		x
Status box on screen	x	x
Reconfigurable printer driver	x	x
Multiple-pass printing	x	x
Single, double or quad density in 1 to 5 passes		x
Full Thor compatibility		x
Lucid A4 manual	x	x
PDQL Grafix printer dump program supplied free		x
24 pin printers fully supported		x
Individually variable X + Y axis magnification on printout		x

DIGITAL PRECISION

PROFESSIONAL ASTROLOGER v1.5

Astrology is one of the subjects that tend to produce arguments which in their turn tend to produce heat rather than light. Too few people, we think, will take a scientific attitude and examine the evidence - including evidence obtained from their own lives - for and against planetary influences on humanity. We do not contend that astrology is either true or false. But we are very aware that throughout the ages, the common man has ridiculed ideas which were subsequently found to contain more than just a grain of truth. Ask Galileo.

PROFESSIONAL ASTROLOGER is a tremendously elaborate program (the user-editable text files alone cover 350K) that will give both the believer and the sceptic his due. It will, given an input of the time of a person's birth, produce upto ten (you adjust) A4 pages of personality and character delineation, as well as six A4 pages of personalised day-to-day and year-to-year predictions (transits and progressions to the cognoscenti). Three A4 pages of text are output in comparisons between two people (synastry). The program features individually adjustable aspect orbs, closing aspect indications, eclipses, rectification, a descriptive command language (with AND/OR/NOT) for identifying astrological conditions and a very very flexible configurator even allowing you to set your own planetary (and other) glyphs!

For lay users let it be said that no previous knowledge of astrology is assumed, but if their interest is aroused, they will find the concepts, methods and tenets of astrology lucidly explained (avoiding difficult words such as tenets).

Professional Astrologer is based on the most accurate astronomical data of any microcomputer program (time: to one minute per century for this century; positions: often bettering published ephemerides) and recognises all the major schools of astrology, with seven house systems catered for. Its speed (<0.5 seconds per computation) has to be seen to be believed (but then it has been compiled with TURBO).

For those who want to test astrological predictions against what they know of some famous men and women, 158 birth data files are included in the package and await your additions.

When hardcopying to a printer without graphics capabilities (a daisywheel, say), text substitution will automatically be made for them. Altogether there are 16 print modes, and a user-configurable printer driver is supplied. Output is possible to any device including a file. Batch processing is supported.

PROFESSIONAL ASTROLOGER is used by professional astrologers in this country as well as abroad. From 1st May 1988 Digital Precision lifted all royalty restrictions on commercial use of PROFESSIONAL ASTROLOGER. PROFESSIONAL ASTRONOMER is available for just £10 if ordered at the same time as PROFESSIONAL ASTROLOGER.

PROFESSIONAL ASTRONOMER v1.5

PROFESSIONAL ASTRONOMER will give you all data on the sun, moon and planets of our solar system in both numerical and graphic form (full planetarium display) for any moment in history. You may specify any of five astronomical co-ordinate systems. The solar system is also shown in parallel projection with zoom, tilt, freeze, auto-increment and other features. The moon, Mercury, Venus and Mars are displayed as seen from earth with real shadows. Eclipses are accurately computed and displayed. The automatic parallax correction feature will not be found anywhere else this side of NASA.

Features and output facilities are as for PROFESSIONAL ASTROLOGER.

SUPER ASTROLOGER

This is a program which, at well under half the price of PROFESSIONAL ASTROLOGER, offers half its power and has features tailored to the casual user. Good fun!

EYE-Q v2.1

EYE-Q is the Definitive QL Graphics system.

Composing a graphics screen has never been easier. The sheer wealth of features of this package is overpowering. EYE-Q is user-friendly too - it is fully driven by pop-up menus, permits single-key entry and comes equipped with 20 pages of context-sensitive on-screen help). Small wonder that most commercial screens and programs using graphics on the QL have been produced with the help of EYE-Q.

Before we enter into details, we must stress that on EYE-Q the same keys perform the same functions throughout the program - obvious, you may say. Seen how few (non-DP) programs have this? EYE-Q is very easy to master because a lot of careful thought has gone into apparently mundane decisions as to what keys do what.

Another thing - on EYE-Q, everything you can do to the whole screen can be done to any part of the screen.

EYE-Q supports windowing, paint/fill (any stipple, can be set to recognise any number of different colours as boundaries - and fills everything), rubber bands (circles, ellipses, rectangles, blocks, lines, arcs), freehand cursor movement, arcs, ellipses, text inclusion (3 text modes plus toggle-off), variable acceleration , horizontal and vertical stretch, reflection, inversion, transfer, recolouring, magnification, reduction, panning, scrolling and zooming. A variable-width cursor is provided (with an option to select OR or XOR mode), as is a multicolour airbrush. A paintbox simplifies the selection of colours and stipples for ink, paper and strip. Screen resolution is switchable at any time. Replicable sprites are catered for, as are automatic anti-aliasing and a hierarchical undo facility (this last feature prevents a lot of heartache). There is switchable graphic screen compression, offset display from origin of your choice, localised save and load, monochrome save, 2 fonts and a font design facility (with over a dozen functions itself), a fully configurable printer driver (supporting proportionality, graphic mode, density etc). ULTRAPRINT, of course, offers so much luxury in the production of hardcopy that it will make you feel positively decadent!

THE DIGITAL PRECISION AD IS CONTINUED OVERLEAF

Graphics-oriented SuperBASIC extensions and two demonstration screens appealing to the eye (and perhaps to the Q) are included.

EYE-Q is fully compatible with DESKTOP PUBLISHER. and SUPER SPRITE GENERATOR. It will happily interface with joysticks, and there is a special version supporting the GIGA mouse (though we think it is best used directly from the keyboard - but that's just our preference). EYE-Q will handle anything from the starkness of a PCB to the beauty of the human form: several demo screens to prove this are included.

EYE-Q is a classic. Simple, powerful, beautiful - and with that undefinable "feel".

SUPER SPRITE GENERATOR v4.0

The definitive developer's tool for action-oriented games or movement-oriented utilities on the QL - in fact many commercial games make use of this package.

SSG permits up to 16 frames for each of 256 multicoloured sprites (upto 16 on the screen at any one time) at individually variable speeds in up to 256 planes. After hundreds of hours of fine-tuning, we have made SSG totally flicker-free. Working with keywords (including some integer ones to squeeze every ounce of speed from your system) from SuperBASIC or machine code, you have hundreds of special effects available at your fingertips.

A demonstration program in SuperBASIC is supplied, to complement the instructions. It is an invaluable aid to mastering SSG.

To confuse SSG with a mere games designer would do it an injustice. This is a system geared to moving things on the screen, FAST. The uses you can put it to are legion.

ULTRAPRINT

Does your QL or Thor talk to an EPSON- or OKI-compatible printer (colour models excluded)? If your answer is "Yes, but ...", you need ULTRAPRINT. Graphic printouts (screen dumps to those who prefer words of one syllable) may be selected from menus offering 22 different sizes and colour-to-b/w translation styles with up to 5 printer passes available (handy for squeezing those last molecules of ink out of your printer ribbon).

ULTRAPRINT is of course fully compatible with EYE-Q, including condensed screens and part screens. There are even two special modes which will handle EYE-Q-designed printed circuit boards and produce perfect originals for production. Screens developed with any other graphics program are also processed with ease.

ULTRAPRINT is very easy to use: the A4 manual has been successfully tested on users normally intimidated by printer configuration procedures. It is blindingly fast - your printer won't know what hit it even when ULTRAPRINT is multitasking with some other program.

SUPER MEDIA MANAGER v1.12

In a perfect world, every byte of your work on the computer would be stored instantly on at least two different devices and never be erased at all. Alas, the real world operates differently, partly for economic reasons, partly from user indolence, and overwhelmingly because of Murphy's law (variant seventeen). Files that have become corrupted or lost on microcartridges or disks can generally be salvaged with SMM, a fully menu-driven device-management system that automates each operation to the limits of feasibility. SMM can cope with cases when one or more sectors are scrambled / erased / damaged, where the directory is scrambled / erased / damaged and even where the drive map is scrambled / erased / damaged. The degree of automaticity of SMM's operation will depend on whether it is possible or not to guess what the original contents were - most of the time, you just sit back and watch.

A total of 350K of program code is provided, permitting every conceivable operation (including many types of viewing, editing and copying) on any medium, file or sector. There are dozens of auxiliary utilities like text translation (eg conversion of LF into LF/CR, changing of filenames to upper/lower case, alphabetising of filenames, sorting directories into file size or date sequence, a directory of directories facility (great if you have lots of cartridges or disks), hex conversion, three modes of string searching, full error trapping with automatic recovery.

You can read from any disk that will physically fit into one of your drives, even if the disk was formatted under an alien operating system such as MS-DOS, PC-DOS, or Acorn DFS (for which access is at file-level). Full sector reading, editing and writing of all "alien" disks is supported.

If there is any medium that Super Media Manager cannot handle, it must be the kind envisaged by Professional Astrologer!

BETTER BASIC EXPERT SYSTEM v2

Input: Your SuperBASIC program - or anyone else's!
Output: If your program is syntactically correct, well structured and easily comprehended by both man and machine: nothing (BETTER BASIC prefers not to burst into panegyrics that would only make your head swell even more).
If you haven't been good: gentle parental chiding and a list of things that were less than perfect, with explanations of what went wrong and suggestions for correction.

BETTER BASIC also takes a careful look at dubious statements in conditional branches, which might not be discovered under the interpreter until first executed on the umpteenth run of your supposedly fully debugged program, when they would wreak all manner of havoc. Following BETTER BASIC's advice, you will get these statements right the first time. Remember, all non-trivial programs contain bugs when they are written. Simply not getting obviously wrong results or crashes at run-time is no guarantee that your program is doing what you think it is. The interpreters available for the QL have no real understanding of the program - this is a direct and inevitable consequence of the way they work, looking at your program as they do just one single statement at a time. As long as the statement seems plausible at the time - taking no account of what lies behind or ahead when making this decision - the interpreters plough on regardless. BETTER BASIC is an analytical tool to identify problem areas and either highlight them or fix them.

DIGITAL PRECISION

There can be no compromise with the remorseless laws of syntax and logic, but wherever there are options of program cosmetics, such as the number of spaces to be used for the indentation of loops and other structures, or the treatment of multiple IFs on a single line, or BETTER BASIC will obey your every wish.

Not only will each program you submit to BETTER BASIC come out in a perfected state, but you will also learn to write better programs in future by looking at BETTER BASIC's analyses. BETTER BASIC is neither pedantic nor fussy - it is pragmatic and indispensable. We use it all the time ourselves.

SUPERFORTH v2.0

FORTH is a threaded language for superfast code, with execution speeds generally superior to those of PASCAL and BASIC. SUPERFORTH compiles the full FORTH-83 (the current industry standard, and the most extensive version). In addition, it provides full string handling and full QDOS compatibility. SUPERFORTH produces stand-alone, executable machine code tasks.

The 100+ page A4 manual gives a lucid introduction into the language, supported by detailed analyses of programs of some complexity - no prior knowledge of FORTH is assumed. To top it all, the package includes an extremely powerful compiled OTHELLO/REVERSI program, which beat the 1983 world-champion (MOI) program at this fascinating logical game. The commented FORTH source code is supplied for your edification.

May the Forth be with you.

3D PRECISION

3D PRECISION is a comprehensive system for true 3 dimensional design (CAD) and manipulation.

3D PRECISION is the only 3D program on any micro that offers Stereo ("Swift Translation and Elegant Rotation of Elements and Objects"). 3D also stands for "Three Divisions", because the package consists of three interacting modules: the Object Editor, the BASIC Toolkit and the Assembler Toolkit. Note that the Object Editor requires at least 256K RAM in order to run.

We must state at the outset that 3D PRECISION is designed for use by people who have no knowledge of, or interest in, programming or technical illustration/drawing. However, programmers too will find the supplied toolkits invaluable in order to include superb 3D effects and manipulations in their programs - there's no requirement for expansion RAM. So there are three levels (everything is 3 with 3DP) at which 3D PRECISION can be used - by non-programmers, high level programmers and low-level programmers.

You can easily design any three-dimensional multicoloured object (technical or artistic) bounded by straight lines and curves (no regularity or uniformity of cross section is required) with 3D PRECISION's fast, fully menu-driven, rubber-banded and help-screened Object Editor, using 3D co-ordinates and/or being guided by the object's on-screen appearance as it develops. You may want to test different viewing angles, shifts, PANS, SCROLLS, scale changes, stretchings, translates, recolouring, recentring, mirrorings, rotations about any axis (not just x, y and z), zooming in and out, moving closer or further (very different from zooming in and out - with zooming, there is no change to perspective) and all sorts of other transmogrifications, before saving individual objects or whole worlds of objects (collections of objects whose relative positions are linked though not necessarily fixed).

Saved objects and worlds may be reloaded and processed under either the Object Editor, a high level language - SuperBASIC is the obvious one, and 3D PRECISION loves TURBO - or assembly language code, with several dozen commands/routines and modifiable default parameters added by the respective toolkit). There is also a separate configurator with scores of options (even as to the keys to be used for each Object Editor command!). Screens (2D projections) can also be output to an Epson-compatible printer or to a file (perhaps for further processing by - say - DESKTOP PUBLISHER or EYE-Q).

3D PRECISION includes several demonstration programs: see a spacecraft land, an explosion taking place, and a car being driven around several blocks in a suburb (both from the driver's view and in birds-eye) and marvel at the speed achieved - 3D PRECISION's operation is so rapid that 3D animation is achievable. At the 1987 PCW show, a certain well-known personage (who was into electric cars at one time) stopped to gape at a display where a prototype 3D PRECISION was working and said "You are not going to tell me that is running on a QL, are you?"!

If you are impressed by huge tables of commands, here are those for 3D PRECISION - first BASIC keywords, then assembly language modules, and then configurable parameters:

GBACKPLANE / GCAMADDR / GCENTEROBJ / GCHANGEOBJ / GCLEAR / GCLOSE / GCLS / GDATAADDR / GDEFINEOBJ / GDRAWTYPE / GERROR / GFACTOR / GFINDDOT / GFINDLINE / GFINDMAX / GFINDPOS / GINK / GINSERTOBJ / GLOADOBJ / GMAKE / GMARKDOT / GMARKLINE / GMARKOBJ / GMARKPOS / GMODE / GMOVEPOS / GMOVE / GNOOBJMAX / GNOOBJ / GOBJADDR / GOBJMAX / GOVER / GPAPER / GPLACE / GPLOT / GREMOVEDOT / GREMOVELINE / GREMOVEOBJ / GREMOVEPOS / GROTATEPOSX / GROTATEPOSY / GROTATEPOSZ / GROTATEPOS / GROTATEX / GROTATEY / GROTATEZ / GROTATE / GRXVALUE / GRYVALUE / GRZVALUE / GSAVEOBJ / GSCALE / GSETDOT / GSETLINE / GSETPOS / GSIZEOBJ / GSTART / GSWAP / GTRAPERROR / GWINDOW

ADDRCAMERA / ADDRCAMOBJ / ADDROBJECT / CENTEROBJECT / CHANGEOBJECT / CLEAROBJECT / CLOSE / CLS / CONV16 / DEFINEOBJECT / DOT3D / DOT / DRAWTYPE / FINDMAX / INK / INSERTOBJECT / LINE3D / LINE / LOADOBJECT / MAKEOBJECT / MARKOBJECT / MODE / MOVECAMERA / MOVEOBJECT / MOVEPOS / OVER / PAPER / PLACE3D / PLACE / PLOTFREE / PLOTOBJECT / REMOVEDOT / REMOVELINE / REMOVEOBJECT / REMOVEPOS / ROTATE16 / ROTATECAMERA / ROTATEINIT16 / ROTATEOBJECT / ROTATEPOSX / ROTATEPOSY / ROTATEPOSZ ROTATEPOS / ROTATEX16 / ROTATEY16 / ROTATEZ16 / SAVEOBJECT / SCALE / SIZEOBJECT / START / SWAPOBJECT / WINDOW / WORKFREE

ADDREXECLIST / AFTERFILE / BASICDEF / CAMADDR / CHANNEL / COLOUR / COMMAND / DOTTYPEADDR / DOTTYPE / DRAWSTAK / ERRORNO FILEPOS / FLAGS / GVARCAMCENX / GVARCAMCENY / GVARCAMCENZ / GVARDISTX16 / GVARDISTX / GVARDISTY16 / GVARDISTY / GVARDISTZ16 / GVARDISTZ / GVARDOTTAB / GVARFLAG / GVARHLIM / GVARLINETAB / GVARNPM / GVARNP / GVARNLM / GVARNL / GVARNVM GVARNV / GVAROBJLEN / GVARPOSTAB / GVARSF / GVARSIZE / GVARSX / GVARSY / GVARSZ / GVARX1 / GVARX2 / GVARX16 / GVARXA / GVARXLH / GVARXL / GVARX / GVARY1 / GVARY2 / GVARY16 / GVARYA / GVARYLH / GVARYL / GVARY / GVARZ16 / GVARZA / GVARZL / GVARZ / LINETYPEADDR / LINETYPE / MEMTOP / MODE / NOOBJMAX / NOOBJN / OBJMAX / OVER / POSFLAG / POSINFO / POSITION / POSXD / POSX / POSYD / POSY / POSZD / POSZ / WORKTAB / X / Y / GCAMCEN / GCAMCENX / GCAMCENY / GCAMCENZ / GCAMX / GCAMXA / GCAMY / GCAMYA / GCAMZ / GCAMZA / GOBJX / GOBJXA / GOBJY / GOBJYA / GOBJZ / GOBJZA

For heaven's sake don't be put off! Non-programmers need never even know about these commands and parameters - the Object Editor is a totally user-friendly front-end which does it all for you!

3D PRECISION's extensive, fully indexed A4 manual is tailored to the thinking styles of non-programmers, BASIC programmers and assembler programmers in its (three) sections.

Has your enjoyment of the QL gone flat with the years? Add an exciting new third dimension with 3D PRECISION!

SUCCESS

The Supreme CP/M Code Emulation System.

CP/M is an operating system written in the early seventies for 8-bit single-user micros. For a long time it had no serious competitor, and thus a truly immense number of excellent (and not so excellent) programs now exists for it: languages like PASCAL, COBOL and FORTRAN, standard packages like dBase, Wordstar, SuperCalc, and thousands of public-domain games: the list is endless. Even MS-DOS does not have as wide a program repertoire.

Normally a program written under a given operating system will not run on a computer which does not support that O/S: the multitasking 32/8-bit QL is not really built to do this kind of thing for CP/M.

Nevertheless, Digital Precision (never known for their reticence in advertising, but equally quite capable of producing minor miracles on a regular basis and not-so-minor ones on demand) has constructed a CP/M emulator. This is a program which will fool the QL into believing that it is a Z80-based machine possessing a CP/M O/S. SUCCESS will thus run any CP/M program. SUCCESS requires at least one disk drive, because your CP/M programs will come on disk. (The SUCCESS manual contains contact addresses for obtaining hosts of public-domain CP/M programs at nominal cost).

The problem with some emulators is that they require too much overhead to maintain the original program's processing speed. Who would want a Wordstar slower than Quill, or a dBASE that is a quarter as fast as the sluggish Archive? SUCCESS, written entirely in machine code, has brilliantly overcome these limitations, thus simulating a Z80 (yes - to be accurate, we have simulated the Z80, not just CP/M) running at 1.8-2.0 MHz! Nor is there even the slightest incompatibility or restriction: everything that runs under CP/M will run SUCCESSfully.

This bit is for technoids. SUCCESS comprises the three standard parts of a CP/M system: BIOS (complete hardware interfacing), BDOS (file handling) and CCP (user communication). BIOS supports microdrives, disk drives, ramdisks (7 drives in all), screen/console and printer ports and two user-definable devices. A drive configurator ensures complete flexibility. For use as a terminal emulator, full VT52 emulation comes as standard.

CP/M disks can be run directly by SUCCESS, or alternatively the DEFINE utility (included in the package) can be used once and for all on each disk to transfer its contents to QDOS. There is also a facility for copying single files. Thereafter you can run any of the programs by running SUCCESS. You can edit them with THE EDITOR, or otherwise access them as if they were QDOS files. Users who do not wish to modify or write any CP/M software need go no further, but many other features are available to the experienced CP/M user. The detailed and comprehensively indexed manual is an invaluable aid both to beginners who wish to explore some of CP/M's more elegant features (eg: .CUM files, STAT, ED, PIP, hotkeys, BOBO assembler, dynamic CP/M debugging and some sexy utilities) and to old hands who want to know what enhancements of standard CP/M the package has to offer.

Refer to the review of SUCCESS that appeared in the June 1988 issue of QL WORLD for an informed and unbiased overview. The review is even more favourable to SUCCESS than this description.

Nothing succeeds like SUCCESS - expand your QL's horizon with thousands of the computer world's favourite programs...

DIGITAL C

C has become the preferred language of many software developers because its compiled programs offer a speed as close to that of machine code as makes no difference. C source programs are well-structured and easy to overview, with none of the problems associated with mile-long assembler listings. No other language holds a candle to the speed and conciseness of C's portable code.

DIGITAL C is, put simply, the fastest C compiler available for the QL. The program's quality may be surmised from the fact that it was itself written in DIGITAL C. In order to be fast in both compilation and execution as well as user-friendly (including QDOS compatibility), DIGITAL C forgoes a full Kernigan and Ritchie implementation with all its daunting complexities but considerably exceeds the popular Small-C specification: additions include a library of floating-point routines as well as a QDOS library offering many I/O routines dear to the SuperBASIC programmer but not normally available in C (screen modes, windowing, graphics, sound, keyboard-handling, device-independence etc, using the same keyword as does SuperBASIC, with the same parameters in the same sequence - no more pointless relearning). 16-bit integers are processed at fantastic speed, and arrays (both numeric and string), pointers, external and global identifiers, macros and conditional compilation are fully supported.

DIGITAL C needs neither extra hardware nor stacks of microdrives. A language that produces marvellously compact code should itself come in compact form, shouldn't it?

The DIGITAL C compiler comprises two tasks, a parser and a code-generator, to do the work assigned to three units in other C compilers. Meticulous optimisation for the QL has resulted in phenomenal speed - refer to page 20 of the independent C review in June 1988 QL WORLD for bench tests, which show a 250 times improvement over interpreted BASIC, and a small improvement over even TURBO. 100x over BASIC is common. DIGITAL C's compiled code is not only fast and fully multitasking but also highly efficient: a library manager program included in the package picks out from the built-in libraries only those functions actually used in a given C program.

Separate compilation of debugged programs/functions into one or more modules is the default mode of operation. Instant linking of these modules is performed by the code-generator. Subsequently, if you want to change one of the modules, that is the only one you need to put through the parser - this speeds up program development no end. The modular approach to programming is the best anyway!

DIGITAL C comes with a lucid manual, comprising a tutorial section for beginners and a reference section including a comprehensive index for tyros and experts alike. Whether C is already your favourite language or whether you are interested in the reasons that so many professional programmers prefer it, DIGITAL C will not disappoint you.

MICROBRIDGE

Nearly every bridge player we've met has told us he wished he were better at it! Of course there are plenty of books that attempt to cure this deficiency, but they all suffer from the lack of a really comprehensive database of commented sample hands to give the learner as much practice at bidding and play as he needs. Obviously we at Digital Precision had to do something about that: our answer is MICROBRIDGE, a program for learning and enjoying contract bridge bidding and play. At least 256K RAM is needed, coupled with an elementary knowledge of Bridge. The storehouse for which closely reasoned, consistently generated comments are available to the user comprises several million randomly-generated (but entirely) reconstructable deals. The bidding system used is standard Acol including the Blackwood and Stayman conventions. No previous knowledge of Acol is required, all relevant terms being explained in the manual, which also contains the text of the lessons. MICROBRIDGE has been highly recommended by practitioners of the game as well as by the Times Higher Education Supplement.

The main part of MICROBRIDGE consists of 16 graded bidding lessons set out with great clarity in the manual and complemented by selected sample hands in lesson files. Each hand is dealt alarmingly fast, and you are asked to make a bid whenever it is your turn. Displayed are the upper and lower limits of the various point counts / cards per suit for your hand, as well as what the bidding has revealed about your partner's hand.

The bid you make may fall in any of four categories: if it is illegal, you will be tersely informed of the fact. If it is outrageous or plainly wrong under Acol, MICROBRIDGE will not let you go on until you have revised it (or overridden the program; in that case you have only yourself to blame for what happens in subsequent play). If your bid is acceptable but sub-optimal, MICROBRIDGE will accept it if you tell it. If it is the optimum bid under the circumstances (or one of several such), MICROBRIDGE will tell you so and continue. Your opponents will always be assumed to pass, and the computer will make the bid for your partner. This continues until a contract is reached. At every stage you may ask for a detailed analysis of the reasons leading to, and the conclusions to be drawn from, each bid. No other computer bridge program comes anywhere as close to simulating the thought processes of an experienced bridge player - indeed, they do not even try.

The bidding of the hand may then be repeated, with a chance for modification, or you may move on to playing the hand (always as declarer, since you won't learn all that much from being dummy) or to the next deal.

After the hands selected by MICROBRIDGE for any lesson have been used up, or whenever you feel like a practice session, you may choose as many further sample hands as you like. You can either be North all the time or alternate between North and South, you may specify random or better-than-average hands (for training in slam bidding, for instance), and you may intervene on your partner's behalf or let the QL bid his hand.

The playing phase is where you must expiate whatever bidding mistakes you may have made. No more help is available at this stage, and the computer will play opponents' hands to the best of its considerable ability. It will draw every logical inference from the bidding and from previous play, but it will never cheat by 'looking' at unseen hands, let alone by exchanging cards between opponents to defeat your finesses. Every contract fulfilled by you will thus be to your credit, and if you go down it will be in honourable defeat.

MICROBRIDGE's user-friendliness is well marked in this phase. You select the card to be played by two keypresses, one for the suit and one for the denomination; but a single keypress will do in situations where there is no ambiguity, e.g. when following suit. You may also use the up or down arrow to select the highest or lowest card of a suit respectively. The program will even override you on the former and play a low card if the trick is already irrevocably lost.

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IDIS is an indispensable tool for all serious assembler programmers: it has many new features not found in other disassemblers. It is also ideal for beginners at assembler programming. Perhaps its largest benefits are to those who only want to potter about with other people's 68000 code - without first mastering all the intricacies of assembly language.

COMPATIBILITY with the full MOTOROLA 68000 instruction set is of course one feature of IDIS. But while most other disassemblers for the QL do not have full compatibility, a few of them do. So what makes IDIS so special?

AUTOMATIC and intelligent disassembly is IDIS's hallmark. Subroutines called by jump instructions (like JSR and Bcc) are automatically disassembled. References to addresses are automatically replaced by labels, which are far more human-friendly than long numbers. Further, program and data are automatically discriminated between, of immense value when attempting to understand someone else's code (and a huge time-saver too). With IDIS, a lot is going on behind the scenes - you command, we interpret, search, analyse and then obey - all at lightning speed.

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DIGITAL PRECISION

DIY TOOLKIT

Since March Marcus Jeffery and I have presented a series of useful QL machine code routines, written as extensions for SuperBasic. If you have been following the series you probably have many small files, each containing between one and three routines. This month I present *Customkit*, a program which lets you combine these small files and other utilities which load in the same way into a custom-made toolkit. This idea was suggested by DIY Toolkit reader Phil Spink.

Listing 1, the Customkit program, uses the GetHEAD command to find the length of each file which is to merge. GetHEAD was introduced in the February DIY Toolkit. You cannot run Customkit unless you load the GetHEAD routine first, so I have listed a Basic program which generates the code for GetHEAD, in case you did not see the relevant issued of *QL World*.

Listing 2 loads the machine code of GetHEAD from DATA statements and saves the code in a file. Before you can load and run Customkit you must load the GetHEAD code, as follows:

```
base=RESPR(144) : LBYTES "file name",base : CALL base
```

The first part of listing two is a standard loader, used in every month's DIY Toolkit project. Only the DATA, from line 590 onwards, change from month to month.

The Customkit program in listing one can combine any number of files which are loaded and linked with the sequence of commands RESPR/LBYTES/CALL, as used to load GetHEAD. If you use several different DIY Toolkit routines or similar utilities, you probably have a long sequence of these commands in the BOOT program which runs when you re-set the computer.

When I turn on my machine it normally loads *Speedscreen*, Turbo Toolkit, a handful of DIY Toolkit routines, the machine code monitor QMON and RAMPRT, a RAM disc and print spooler. Until I wrote Customkit all the files were loaded and called separately in their own reserved memory spaces. Customkit lets me combine all those files into one, speeding loading and simplifying my BOOT program.

So far as I know, Customkit is compatible with all commercially-available Toolkit programs and other utilities which load into resident procedure space. There is only one restriction — the total length of all the files combined, apart from the last one, must be less than 32K or Customkit will not be able to link them.

If that causes problems you should make sure that the largest file you want to link is the last one you name to Customkit. You may still need to use two files if some components are very long. In practice, this is not a serious restriction as most Toolkit packages are only a few kilobytes long and individual resident procedures average only about 200 bytes each.

These short files are the ones which give the most benefit when you combine them. The QL allocates resident procedure space in fixed-size portions of 512 bytes, so you can sometimes save a signficant amount of memory by merging many small routines into one file, rather than loading them separately.

You also get a useful improvement in loading speed, particularly when using Microdrives, as the LBYTES

Listing 1 - QL WORLD DIY TOOLKIT July 1988

```
100 REMark CUSTOMKIT - Resident procedure merger
110 REMark Copyright 1988 Simon N Goodwin
120 REMark Version 0.2 Monday 2/5/88
130 :
140 max_name_len%=36 : white=7 : black=0
150 MODE 4 : PAPER black : INK white : CSIZE 1,0 : CLS
160 PRINT "RESIDENT PROCEDURE & FUNCTION MERGER"
170 PRINT \"Enter the name of the device holding"
180 INPUT "the files to be merged (e.g. FLP1_): ";dev$
190 IF LEN(dev$)=4:dev$=dev$ & "_"
200 INPUT \"Enter the total number of files: ";num_of_files%
210 IF num_of_files%<1 : STOP : ELSE PRINT
220 DIM length(num_of_files%),name$(num_of_files%,max_name_len%)
230 :
240 REMark Work out code space requirements
250 head_buffer=RESPR(64)
260 total_length=4*num_of_files%-4
270 FOR i=1 TO num_of_files%
280   INPUT "Enter the full name of file #";(i);" : ";name$(i)
290   OPEN_IN #3,dev$ & name$(i)
300   GetHEAD #3,head_buffer
310   CLOSE #3
320   IF total_length>32768
330     PRINT \"**** Total file length exceeds 32K!" : STOP
340   END IF
350   length(i)=PEEK_L(head_buffer)
360   total_length=total_length+length(i)
370 END FOR i
380 :
390 REMark Assemble composite file
400 base=RESPR(total_length)
410 CLS
420 PRINT "Code starts at ";base;", length ";total_length
430 PRINT
440 new_base=base+4*num_of_files%-4
450 FOR i=1 TO num_of_files%
460   LBYTES dev$ & name$(i),new_base
470   PRINT name$(i) TO 37;"loaded to ";new_base
480   new_base=new_base+length(i)
490 END FOR i
500 :
510 REMark Generate linking code
520 new_base=base+4*num_of_files%-4
530 FOR i=2 TO num_of_files%
540   POKE_W base+i*4-8,20154
550   new_base=new_base+length(i-1)
560   POKE_W base+i*4-6,new_base-(base+i*4-6)
570 END FOR i
580 :
590 REMark Create merged file
600 INPUT \"Enter output file name: ";op_name$
610 SBYTES op_name$,base,total_length
620 PRINT \op_name$;" has been created."
630 PRINT \"Enter "; : PAPER white : INK black
640 PRINT " CALL base "; : PAPER black : INK white
650 PRINT " to link the commands to BASIC."
660 PRINT \"To load the merged file, enter:"
670 PAPER white : INK black : PRINT \" X=RESPR(";total_length;
680 PRINT "):LBYTES ";op_name$;",X:CALL X "
690 PAPER black : INK white : STOP
```

This month Simon Goodwin presents a program to combine DIY Toolkit files into a custom toolkit.

command gives best performance when loading large files. If you load a small file with LBYTES the command usually spends more time seeking the start of the data than it does loading it.

Customkit expects you to have copied all the files you want to merge on to a single disc or cartridge. When you RUN the program the first question it asks is the name of the device containing the files you want to combine. This need not be the device you intend to use to store the combined file.

Once you have supplied the device name, Customkit asks you how many files you want to combine and asks for the full name of each. Type the file names as they would appear in a DIR listing. The routine is not error-trapped, as there are many ways of detecting QL errors and I want to present a program which works, albeit simply, on all QLs.

If you are feeling keen you can add a check that specified files exist at line 285. Otherwise incorrect names will cause an error at line 290 and you will have to revive the program by checking the correct name and entering it into a command like:

NAME$(I)="<Correct File Name>": RETRY

If you get a 'bad name' error at line 300 you have forgotten to load the GetHEAD extension. Save Customkit, then type NEW and load the extension. When you re-load Customkit the problem will have vanished.

Customkit works by building a table of file names and sizes in the arrays NAME$ and LENGTH. When it knows all the file details it reserves an area of memory to hold the combined file. It needs sufficient bytes for every file, plus four bytes for each file apart from the first. The extra space is used by the linking code which makes sure that every routine is initialised when you CALL the start of the combined file.

The second loop leaves a space at the start of the memory area for the linking code and then loads the invididual files contiguously thereafter.

The last loop is the clever item; it generates a series of PC-relative JSR instructions to call the start of each routine after the first. The code of the first routine is immediately after these subroutine calls, so it is executed once all the other routines have been called. The word 20154 corresponds to the instruction:

JSR OFFSET(PC)

The next word in memory is the offset, a signed word value which indicates the difference, in bytes, between its own address and the address of the routine which is to be called. Line 560 works out the relevant offsets and stores them after each JSR instruction.

The final section of the program saves the combined file on any device you specify and displays the instructions needed to re-load it. The code stays in memory, because of the way the RESPR command works, so you should re-set your QL before trying to run programs which need a good deal of RAM.

● *Next month there will be more machine code tricks and treats, plus a summary of the 10 most common bugs in published resident procedure code. If you would like me to explore a specific area, or implement new commands, particularly ones unavailable in commercial toolkits, please send suggestions.*

Listing 2 - QL WORLD DIY TOOLKIT July 1988

```
100 REMark Sinclair QL World HEX LOADER
110 REMark by Marcus Jeffery & Simon N Goodwin
120 :
130 CLS
150 RESTORE : READ space : start = RESPR(space)
160 PRINT "Loading Hex..." : HEX_LOAD start
170 INPUT "Save to file... ";f$
180 SBYTES f$,start,byte : STOP
190 :
200 DEFine FuNction DECIMAL(x)
210 RETurn CODE(h$(x))-48-7*(h$(x)>"9")
220 END DEFine DECIMAL
230 :
240 DEFine PROCedure HEX_LOAD(start)
290 byte = 0 : checksum = 0
300 REPeat load_hex_digits
310    READ h$
320    IF h$="*" : EXIT load_hex_digits
330    IF LEN(h$) MOD 2
340       PRINT"Odd number of hex digits in: ";h$
350       STOP
360    END IF
370    FOR b = 1 TO LEN(h$) STEP 2
380       hb = DECIMAL(b) : lb = DECIMAL(b+1)
390       IF hb<0 OR hb>15 OR lb<0 OR lb>15
400          PRINT"Illegal hex digit in: ";h$
410          STOP
420       END IF
430       POKE start+byte,16*hb+lb
440       checksum = checksum + 16*hb + lb
450       byte = byte + 1
460    END FOR b
470 END REPeat load_hex_digits
480 READ check
490 IF check <> checksum
500    PRINT"Checksum incorrect. Recheck data."
510    STOP
520 ELSE
530    PRINT"Checksum is correct"
540    PRINT"Data entered at: ";start
550 END IF
560 END DEFine HEX_LOAD
570 :
580 REMark Space requirements for the machine code
590 DATA 144
600 :
610 REMark Machine code data
620 DATA "43FA000A34790000","01104ED20002001E"
630 DATA "074765744845144","0010075365744845"
640 DATA "4144000000000000","7846600027847BBCB"
650 DATA "675A2A0D4BEB0008","3479000001124E92"
660 DATA "664C3031E80054AE","0058264D2A45C0FC"
670 DATA "0028D0AE0030B0AE","00346C2C2A360800"
680 DATA "6B26347900000118","4E92662253436610"
690 DATA "2031E80008000000","6612204522407440"
700 DATA "766420044E434E75","70FA4E7570F14E75"
710 DATA "*",10007
```

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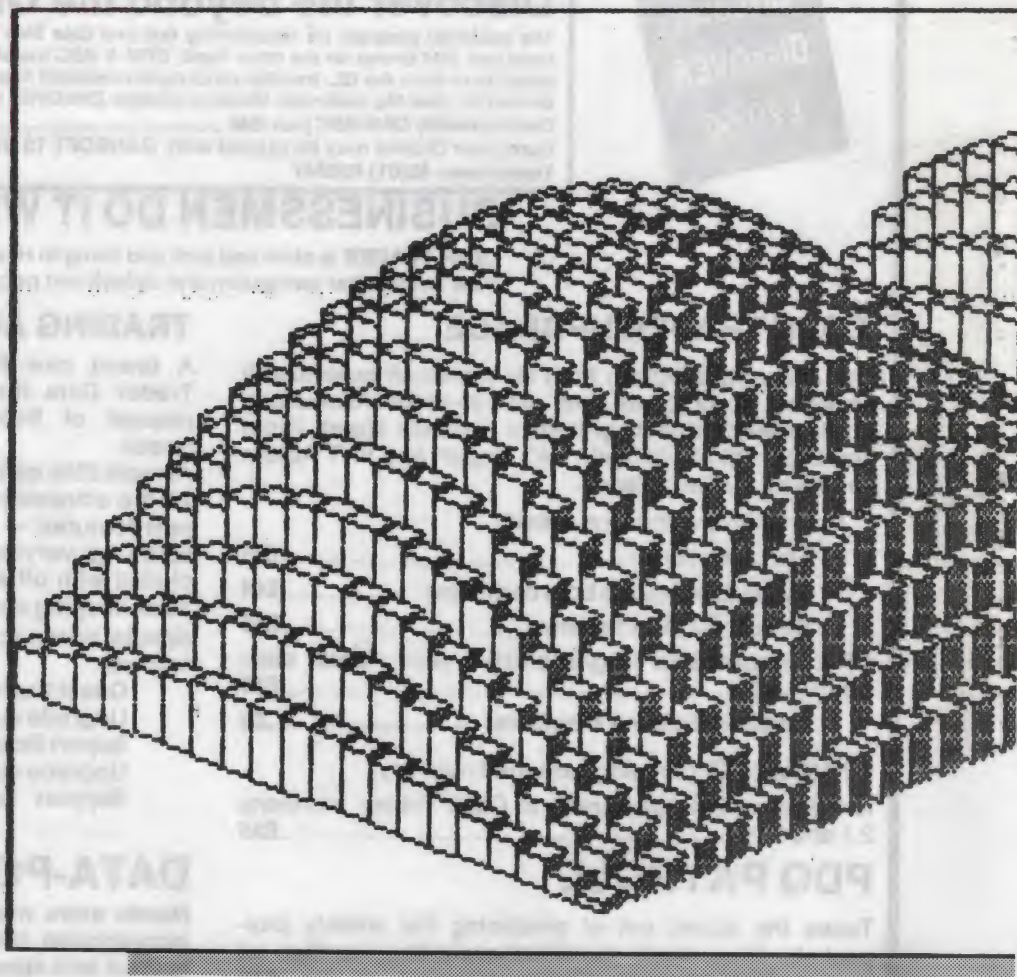
SUPER BASIC

Mike Lloyd concludes with the fourth and last part of the 3D Graph project.



At the outset of the *3D Graph* programming project its objectives and overall stucture was formulated. In the intervening months the procedures and functions directly responsible for meeting the aims of the program were written more or less independently. The final part of the program development is a menu-driven control system which links these parts.

It is worth examining whether this is the proper moment to be thinking about how the user will control the program. An important measure of the competence of any piece of software is the ease with which the user interacts with it. The highest quality of programming will not compensate for poor menu structures, illogical intstructions or unhelpful screen layouts. As a general rule the more important something, then, is the earlier in the development cycle it should be tackled. Given the importance of control systems it would be normal to produce menus early in the project so that they are not influenced adversely by less important matters and they can have their due influence on the further development of the program.

The reasons leading to 3D Graph being written dictated a different priority. The brief was to produce a series of printed three-dimensional graphs at very short notice, so there was little time to worry about the niceties of a coherent menu structure. The sponsor was not asking for a program but for its output, so how the results were obtained was unimportant. It was only when the program was destined for better things, including being used by other people, that the primitive controls provided by the test harness published two months ago were replaced by a more friendly, menu-driven control system.

With a well-structured program it should be possible to impose almost any control arrangement without making major amendments to the program code. While 3D Graph graphics and communication areas might be complex, the overall structure of the program comprises three stages place in a loop:

1 Selection options and load data
2 Draw graph
3 Print graph

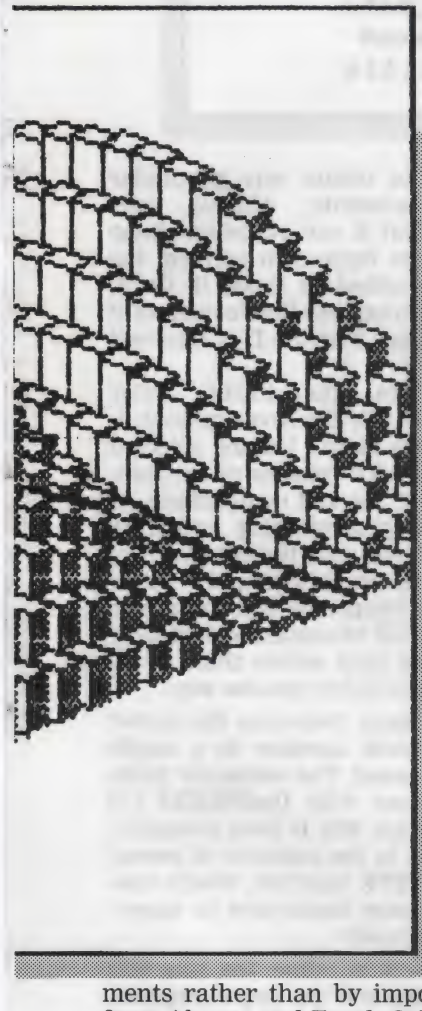
Additionaly, when the program is first run the global variables and data structures are initialised ready for use. It is bad practice to create global variables indiscriminately at the point in the program where they are first used because the DIM and LET commands, important elements in the program self-documentation, can become lost in the code. It is much better to place them in their own module where they can be read, referred to and amended with ease.

The test harness published as listing 0 in the April, 1988 issue allowed readers to get part of the program working before all the segments had been published. Its original purpose was to allow partly-completed modules to be tested during the development of the program. It is now time to remove the test harness from the program with a judicious delete command, such as *DLINE TO 99,* and replace it with two procedures.

The first addition, at listing one, is a neater way of establishing the data structures and initialising the global variables to their default settings. New features include setting the graph title

to read "NO DATA LOADED" as a warning to the user and the placing of a solitary value in the INFO array so that accidental calls to display the graph before there is any data available are not fatal. The Psion screen dump is also loaded from the cartridge in mdv1—. Readers may wish to incorporate a favourite screen dump program by amending this line and the CALL command in listing seven.

The second procedure, listing two, is useful to programmers who prefer inserting information via DATA statements rather than by importing files from Abacus and Easel. Called from a menu option, this routine reads the graph title and the number of rows and columns it will contain. It then looks for an ordered set of data. Included in the routine are the values used to produce the graph prominently displayed in the April SuperBasic.



From graphs to graphics

By removing these DATA statements and inserting new ones, with appropriate changes to the values at line 245, readers can plot their own graphs, remembering that the data structures allow maximum row and column widths of 10 items. This method of supplying data can, of course, be ignored in favour of the file-importing routines developed last month. The remaining listings published this month deal with the menu system. Remembering that menu structures were put into the spotlight in the July-August, 1987 edition of *Sinclair QL World*, readers may wonder what might be left to add. Deliberately withheld from those articles was the "initial letter" method of menu selection which features so strongly in the Psion programs. As 3D Graph is designed to work closely with the Psion packages it seems only right that it should share their control systems.

All menu structures, whatever strategy they use, have three main elements — the presentation of menu choices on the screen; the detection of the user's selection; and the activation of the routines required to carry-out the user's wishes. Although there is no firm rule it is usually best to keep the code for these three aspects in separate procedures.

Listing eight handles the first element of the menu structure by giving users information about the 11 keypresses which affect the program. The default window settings are altered to create an area in which the title of the current data is displayed across the top of the screen and then altered again to list the options at the right-hand side of the screen.

The repeated use of the default window channel in this way saves a worthwhile amount of memory space on an unexpanded QL, leaves other channels available for other uses and saves typing as a channel number does

◄ Listing 1

```
100 DEFine PROCedure Initialise
105 WINDOW 512, 256, 0, 0: MODE 4
110 CSIZE 1, 0: PAPER 0: INK 7: CLS
115 Angle  = 10:    REMark    0 < A < 20
120 Elev   = 10:    REMark    0 < E < 20
125 Cwide  = .7:    REMark   .1 < C < 1
130 Cmax = 1: Rmax = 1
135 DIM INFO (10, 10): INFO (1, 1) = 1
140 DIM Rnote$ (10, 10)
145 DIM Cnote$ (10, 10)
150 DIM Title$ (40)
155 Title$ = "NO DATA LOADED"
160 AT 5, 5: PRINT "3D GRAPH - Mike Lloyd 1987"
165 RETurn
170 REMark ENSURE MDV1_ CONTAINS GPRINT_PRT
175 Dump = RESPR (1400): LBYTES mdv1_gprint_prt, D
ump
180 REMark ... Set BAUD rate if necessary
185 END DEFine Initialise
```

◄ Listing 2

```
200 DEFine PROCedure Prog_data
205 RESTORE 245
210 READ Title$, Cmax, Rmax
215 FOR y = 1 TO Cmax: READ Cnote$ (y)
220 FOR x = 1 TO Rmax
225   READ Rnote$ (x)
230   FOR y = 1 TO Cmax: READ INFO (x, y)
235 END FOR x
240     REMark data title, Cmax and Rmax
245 DATA "Representative Prices 1985/87", 4, 5
250     REMark Main data
255 DATA "Printer", "Monitor", "QL", "Dual Discs"
260 DATA "Feb 85", 310, 275, 400, 574
265 DATA "Aug 85", 299, 253, 385, 420
270 DATA "Feb 86", 299, 254, 199, 279
275 DATA "Aug 86", 299, 254, 149, 299
280 DATA "Feb 87", 289, 249, 150, 289
285 END DEFine Prog_data
```

◄ Listing 7

```
700 REMark          Main Routine
704 Initialise: Menu
708 REPeat loop
712 AT  6, 13: PRINT Cwide *10; "0%": CLS 4
716 AT 11, 15: PRINT Angle: CLS 4
720 AT 12, 15: PRINT Elev: CLS 4
724 key = Choice
728 SELect ON key
732 =  1: Prog_data: Menu
736 =  2: Load_data: Menu
740 =  3: Shade = 0: Scalex: Box: Wait
744 =  4: Shade = 7: Scalex: Box: CALL Dump: Wait
748 =  5: Cwide = (1+ (Cwide *10) MOD 10) /10
750 =  6: New_title
752 =  7: MODE 4: STOP
756 =  8: Angle = (Angle -1) MOD 21
760 =  9: Angle = (Angle +1) MOD 21
764 = 10: Elev = (Elev +1) MOD 21
768 = 11: Elev = (Elev -1) MOD 21
772 END SELect
776 END REPeat loop
780 REMark end of main routine
```

```
List of Program Modules

 100 DEFine PROCedure Initialise
 200 DEFine PROCedure Prog_data
 300 DEFine PROCedure Scalex
 400 DEFine PROCedure Box
 500 DEFine PROCedure Side (face)
 600 DEFine PROCedure Top
 700 REMark              Main Routine
 800 DEFine PROCedure Menu
 900 DEFine FuNction Choice
1000 DEFine PROCedure Wait
1100 DEFine PROCedure Load_data
1200 DEFine FuNction Filename$
1300 DEFine PROCedure New_title
```

not have to be appended to commands such as WINDOW, PRINT, PAPER and BORDER. The positioning of the menu areas on the screen leaves as much of the graph as possible visible, so that changes to the viewing angles can better be judged.

The menu is presented very compactly on the screen because there is no need to specify which keys control which options, except for the viewing angle controls which are linked to the cursor keys. The disadvantage of the "initial letter" method of indicating valid keypresses is that only small menu systems can be managed in this way. It is also unsuitable if intended users could not be expected to know their way round a typewriter keyboard.

The Psion programs reach, some would say exceed, the limits of practicality for "initial letter" menus. The larger the number of menu options, the more likely it is that descriptions of the program functions will begin with the same letter and thus cannot be used. Cures include splitting a menu into a number of small sub-menus, misspelling words and using inconsistent naming conventions.

The Quill menu is sub-divided into two pages with additional menus for typesetting, page design and file management options, thus adding extra keypresses to obtain any particular option. Meanwhile, Abacus uses Xecute so that E can represent Echo and then uses Rubout to perform the function described as Erase in Quill. Neither menu can use Delete instead of erase or rubout because D is reserved for Design.

Nevertheless, the initial letter system is ideal for the seven options in the 3D Graph menu. Having selected this approach for reasons of compatibility, ease of use and compactness of display, the programming problems had to be solved with the minimum of code. There is no pattern to the ASCII values of the keypresses and most keys have two ASCII values associated with them. Listing nine solves those problems in a remarkably concise way.

The valid keys, including the cursor keys, are stored together in a single string call *menu$*. The computer waits for a keypress with the*INKEY$ (-1)* function at line 935. It then compares the keypress to the contents of *menu$* using the INSTR function, which converts lower-case characters to uppercase automatically.

If no match is found the function returns a zero and the loop continues. Non-zero values show the location of the matched letter in the string so that options can be referred to as 1, 2, 3, and so on in the rest of the program. Incidentally, the short statement *IF key:* in line 940 is short for *IF key < > 0 THEN.*

The advantage of analysing keypresses in this way is seen in the main program loop. Listing seven provides the top level of program structure. It begins by initialising the variables, establishing the data structures and calling the menu screen display. It then enters a loop governed by the user's keypresses. At the start of the loop the information in the menu window is updated and then a valid keypress is awaited. A SELect structure follows in which the options are

Listing 8 ▶

```
800 DEFine PROCedure Menu
805 LOCal n, text$
810 WINDOW 446, 24, 34, 11: BORDER 2, 2
815 CLS: BORDER 6: RESTORE 800
820 PRINT " CURRENT DATA = "; Title$
825 WINDOW 160, 146, 320, 33: BORDER 2, 2: CLS
830 CLS: BORDER 6
835   FOR n = 1 TO 7
840     READ text$: PRINT text$
845     IF (n +1) MOD 2: PRINT
850   END FOR n
855 PRINT \ CHR$(188); CHR$(189) ! "View angle"
860 PRINT CHR$(190); CHR$(191) ! "View height"
865 DATA "Program data", "Load data"
870 DATA "View graph", "Dump graph"
875 DATA "Block width", "Title graph", "Quit"
880 END DEFine Menu
```

Listing 9 ▶

```
900 DEFine FuNction Choice
905 LOCal key, loop, n, menu$
910 menu$ = "PLVDBTQ"
915 FOR n = 1 TO 4
920   menu$ = menu$ & CHR$(184 +n *8)
925 END FOR n
930 REPeat loop
935   key = INKEY$ (-1) INSTR menu$
940   IF key: RETurn key
945 END REPeat loop
950 END DEFine Choice
```

Listing 10 ▶

```
1000 DEFine PROCedure Wait
1010 LOCal loop, key
1020 REPeat loop
1025 key = CODE (INKEY$ (-1))
1026 SELect ON key = 10, 27, 240: Menu: RETurn
1028 END REPeat loop
1030 END DEFine Wait
```

numbered from 1 to 11, a much more satisfactory arrangement for the programmer than using clumsy ASCII values.

The first two options load data from DATA statements within the program or from exported Psion files. The next pair of options produces graph images. The first uses blackshading and edging for screen displays and the second uses white shading and edging which is best for inverse video printed graphs. Line 744 is set up to call the Psion screen dump routine and should be amended if another screen dump is substituted. It is important that the printer is made ready before selecting the Dump option because printing begins immediately the screen has been drawn.

The next option allows users to alter the width of the blocks so that a space can be left between columns. This is done by altering the global variable *Cwide* to one of 10 values between .1 and 1. The menu display, however, expresses the current value of *Cwide* as a percentage, which is easier to understand.

Option six gives the user the chance to change the title of the graph, which is particularly useful if imported files are used because the filename is stored initially in the title string rather than what the user might prefer to see on the screen. The seventh option is the only way to exit from the program, other than by pressing the break combination. The program can be restarted without losing stored data by typing RUN 708.

The last four options control the viewing angle, giving the freedom to move the imaginary "viewing position" both horizontally and vertically by pressing the cursor keys. The values step from 1 to 20. Users can experiment with different viewing positions and block widths to get the most satifying displays.

There are two points in the program where processing halts awaiting input from the user. The first is when menu choices are expected and the second is after a screen display had been drawn. The latter is controlled by the wait display at listing 10. For compatibility with a screen dump routine which requires a keypress to activate them, only three keys and the F3 function key. Regular users of Psion programs instinctively will press the F3 key to obtain the menu.

The finished program should be cross-checked with the list of user deifinations at figure two to make sure all the elements are present and then saved to a Microdrive, preferably one which also has a copy of *gprint—prt* on it. To transfer the screen dump program, place the Easel cartridge in Drive#2 and the 3D Graph program in Drive#1 and enter the following command:

```
COPY MDV2—GPRINT—PRT TO
MDV1—GPRINT—PRT
```

The program can now be errortested with the data included in listing two. Type LRUN followed by the filename of the program and choose the menu options.

Adventurous readers wishing to expand the program beyond its original bounds might like to emulate the output at figure one. The row and column labels were inhibited, the size of the INFO array was increased and the values were created from a formula in Abacus.

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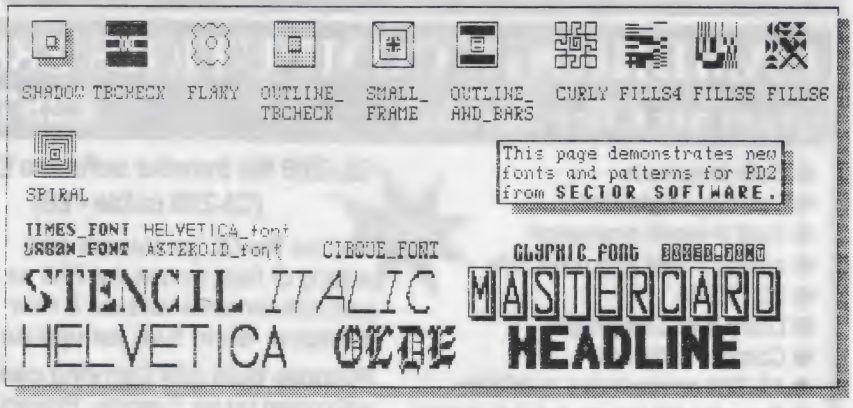

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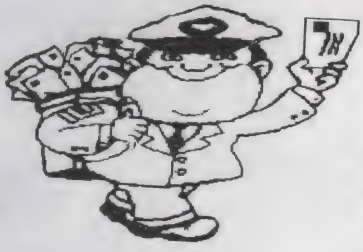

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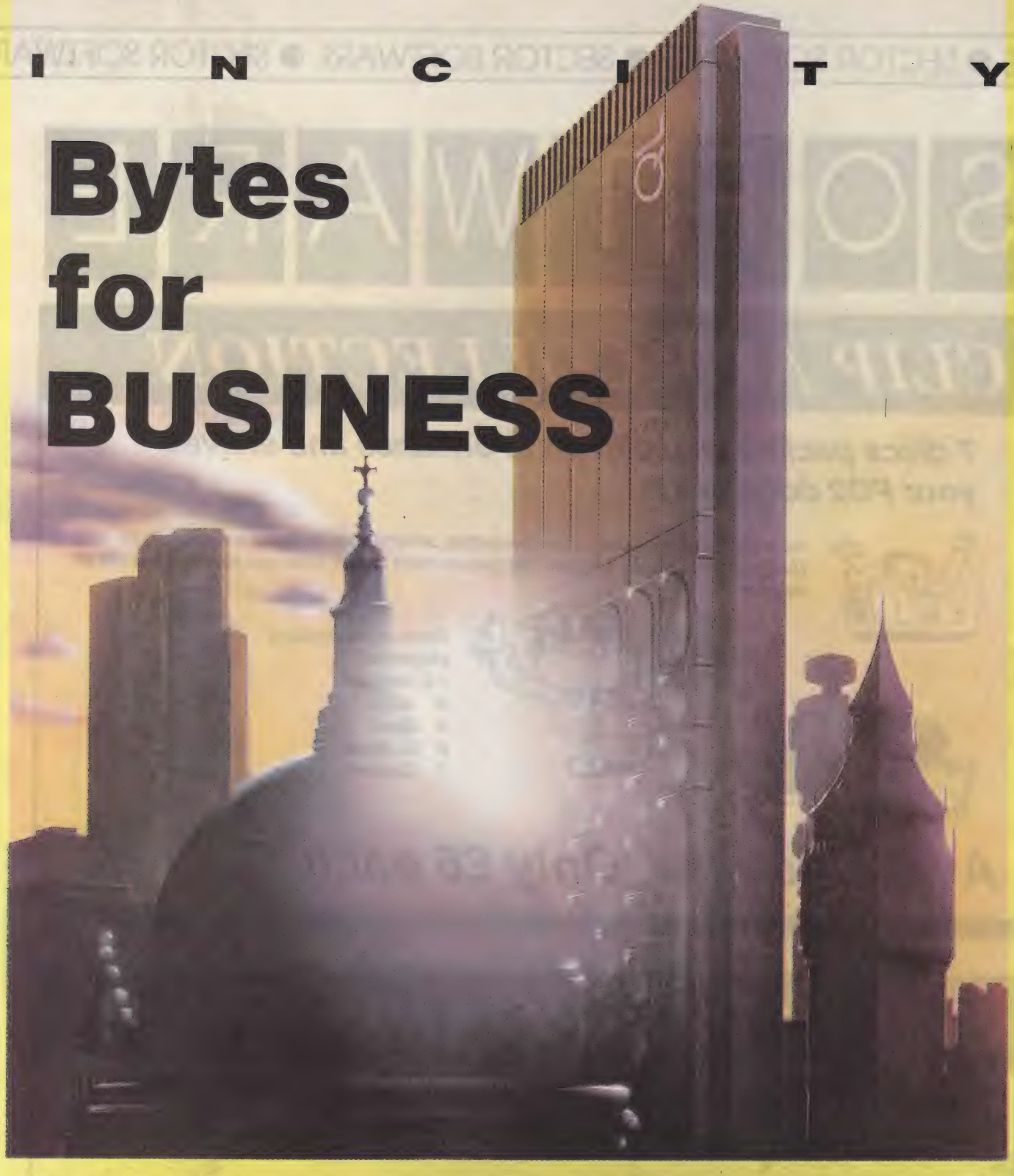


Starting this month: Leslie Fahidy assesses the QL computing scene for business users

This is the first of a new series for those who use the QL for business applications. The series will have at least six monthly parts in *Sinclair QL World*.

There is no doubt that the topic is of interest to many; it is also true that the success of any series depends on feedback from readers. This statement is particularly true of business topics. Business computing is an enormous area. I would be willing to write volumes on the subject. Even if we restrict ourselves to the QL, the number of topics still far outweighs the space available. So, instead of complaining to your friends and neighbours that the QL Business Series does not mention the areas in which you are interested, or is not technical enough or too technical, write to me at *QL World* and let me know what you would like to read.

The QL was the culmination of Sir Clive Sinclair's efforts to make computers available to everyone. Whatever the reasons for the failure of the Sinclair empire at the time, the fact remains that the QL is eminently suitable for carrying-out business tasks.

All activities which involve the

writing of information on paper and processing that information lend themselves to computerisation. In most business environments that does not omit much.

The most obvious application of computers in business is as word processors. I assume that readers of *QL World* do not need convincing of the power of a word processor compared to an office typewriter.

Misunderstanding

Database managers are the class of software which, probably, suffers more from this misunderstanding than any other. I have heard business people saying that they have no use for one, since they have a small number of customers and do not write letters to them often. It is unfortunate that the words database manager seem to conjure software which is used for keeping names, addresses and telephone numbers on computer file. Of course it can be used for that but it can also be used for stock control — without which not many businesses can manage — and it can be of great help in keeping employee records, for estimating, invoicing and numerous other functions.

The spreadsheet fares somewhat better in people's estimation. Judging by my experience, most people recognise that it has useful applications.

Sinclair factors apply to computer graphics. Most human beings are more receptive to ideas presented graphically than in words or figures. Except in large businesses where computing is handled by computer professionals, computer graphics are rarely exploited.

Not cheap

As a matter of general principle, a professional business user cannot afford to disregard any of the possibilities which computers offer. We will be examining the cost of computerising; it is not cheap. Once you have bought all the necessary hardware, and invested time, effort and possibly money to learn to use it, it does not make economic sense not to utilise that hardware for every feasible application.

We shall first examine how much it will cost. If your initial calculations suggest that it will not save as much as the amount you have to pay for it, your plan of computerisation is probably premature or you may not have assessed correctly how much money it could save you. While the hobby user can afford the luxury of buying only the bare essentials initially and expanding later, the business user must obtain all or most of the necessary items at the beginning. So the total cost must be assessed in advance.

We cannot make an exact cost calculation; we can, however, gain a good idea of the likely expenditure. The QL is available in many varieties, even excluding its big brother the Thor. Originally, the QL was marketed with 128KB of memory, including ROM, much of which is not available for storing programs and data. The question is whether or not the 128K is sufficient for your purposes. Five years ago it was the dream of most home computer users to have a machine with 128K of memory. In those days I thought that the 64K of the CP/M operating system was enormous. All the same, 128K of memory is insufficient for many of today's applications. It is possible to purchase extra RAM on top of the 128K built-in, in either of two ways.

"Database managers suffer more from misunderstanding than any other software."

The magic limit with respect to total memory is 640KB and you may buy a memory expansion card from a number of sources to reach that limit. These expansion cards plug into the QL expansion interface at the side and they stick out slightly from the body. Alternatively, you may buy a QL which has the extra memory fitted internally, with no need to plug in anything and nothing sticking out. From a price point of view, there is nothing to choose between the two methods. The expansion card is a better solution in terms of memory but it has one serious disadvantage — it it not possible, or at least not recommended, to fit a disc drive to a QL which is fitted with an expansion card.

This restriction is purely physical; the disc interface should plug into the same slot as the memory expansion; and, of course, two into one will not go. Admittedly, there is a way round the problem. The expansion card has a slot into which other devices may be plugged but, in the case of a disc interface, it will overhang the body of the QL; I would not risk it.

Fitted RAM

Cumana, a supplier of disc drives and interfaces, used to supply a metal sleeve to bridge the gap between the expansion card and the disc interface. It is no longer available. Our other solution, the internally-fitted memory, does not suffer from this disadvantage as the extra RAM chips are fitted on the circuit board but they have another limitation — the chips are slower in operation. You will have to evaluate whether or not this speed limitation is serious. For me it is not, so I shall use internal RAM.

Generally, if you use the QL mainly for word processing, the slight loss of speed is immaterial; the QL is still a great deal faster than the fastest typist. On the other hand, for extensive number-crunching and/or database management with large volumes of data, the loss in speed is noticeable.

Later in the series I shall look again at add-ons but the information supplied here should suffice for now. What is the cost of it all? Recently I paid £195 inclusive of VAT and delivery for a QL with 640KB of internal RAM. Buying a machine with 128K of internal RAM and adding a memory expansion card would cost approximately the same.

The prospective business user must examine seriously the question of whether or not the QL Microdrives presents a reasonable alternative to discs. In my opinion they do not. Insistence on Microdrives as a means of bulk storage is one of those areas where, in my opinion, Sir Clive definitely went wrong. Luckily, it is possible to add disc drive(s) to the QL and while Microdrives on their own are not really suitable for business, they are a welcome addition when used with one or two disc drives.

The chief complaint about Microdrives is their lack of speed. It is not too serious a problem when storing and loading programs, as in most business applications you would load a program and use it for several hours. When we examine the question of data storage, however, a different picture emerges. The storage and retrieval of data on cartridges is slow.

Apart from speed, Microdrive cartridges have another serious limita-

tion; their reliability is open to question. Losing a program from a cartridge, even an important program, is not the end of the world, though inconvenient, but losing data can ruin a business. On this basis alone I recommend seriously to all business computer users that they should have one or two disc drives.

Basically, there are three choices. A 5¼in. drive, a 3½in. drive or a hard disc. The first on the list, 5¼in., is the most economical in terms of disc prices. They seem to be almost giving away this size of disc these days. They certainly cost less than paper which would store the same amount of information. In spite of this, however, I would opt for 3½in. discs. Their big advantage is that they are more robust and much less prone to pick up dirt. Also bear in mind that with the establishment of IBM OS/2, using 3½in. discs opens the possibility of copying IBM data discs and using them on the QL. The third option is a hard disc, which is very expensive and, frankly, I do not think they are necessary for the scale of application which we are considering. Either size of disc will give you 720KB of storage.

A single drive and interface is likely to cost approximately £200 but the second drive will cost £70. All arguments considered, I would recommend double 3½in. drives. If the budget is tight, you could cope initially with a single drive and add a second later. Likewise, if you are already running a 5¼in. drive or drives, a 3½in. drive can be added, or vice versa.

Printers

It is essential to have a printer. The question is which type of printer and how much is it likely to cost? There are essentially three types of printer; dot matrix, daisywheel and laser. They use different technologies and produce very different results, some more suitable for certain applications than others.

Dot matrix printers, which make up characters from a large number of dots, used to be the cheapest type but that is no longer so. While dot matrix printers have become more sophisticated — though the simpler, cheaper versions are still available — daisywheel printers have fallen in price considerably, so that it is no longer reasonable to distinguish between them on a price basis.

Dot matrix printers have two considerable advantages. Even the cheaper ones are much faster than any but the most expensive daisywheel printer; also it is possible to print graphics characters on a dot matrix printer but not on a daisywheel. Probably of greater significance is the fact that on a daisywheel printer you cannot print different character styles such as italics unless you have obtained a special wheel. Even then, you cannot mix character types in a given text unless you are prepared to stop the print and change the daisywheel halfway through the page. Daisywheel printers have one great advantage compared to their matrix relatives; their output is first class, comparable to that of top-quality electronic typewriters.

"Laser printers use toner cartridges instead of ribbons. These cost around £85, so a laser printer is expensive to run."

You should expect to pay from £200 upwards for a reasonable printer of either type and £350-plus would be a more realistic expectation if you need a printer which can be used for several hours a day, every day, in the office. In that case it is a serious false economy to choose a cheaper, less robust model.

It is not my policy to recommend particular makes of equipment apart from the QL but you should consider an Epson or Epson-compatible printer, particularly in the lower price ranges, for this reason; not that Epsons are better than other printers at the same price but that they have become a virtual industry standard. Any software suppplied with the QL and any additional software you may buy will drive an Epson printer. I am not so sure about the less well-known types. Just note how many questions, on our Technical Helpline pages, request information on setting-up printers.

For the sake of completeness I should mention the more recent appearance on the market of 24-pin printers. Normal dot matrix printers use 8- or 9-pin matrix heads. With 24 pins, however, the print quality they produce is comparable with that of a daisywheel printer. No doubt the time will come when 24-pin printers will dominate the matrix printer scene. For the time being, I advise caution. Many types of software are not equipped to drive such printers and you may finish with a printer which would produce excellent quality — if you had the software to drive it.

Laser printers are in a different league in both performance and price; as they produce their image electronically there is very little limitation on speed or character type and they can also print high-quality graphics images. The printing speed of dot matrix and daisywheel printers is stated in terms of characters per second, while that of laser printers is usually expressed in pages per minute. Six pages per minute is acceptable; the better ones print eight or more pages per minute. Obviously, a laser printer is essential for any organisation which sends large amounts of mail. Circulars to 2-3,000 addresses at a time is a definite possibility with a laser printer but scarcely practicable with any other type.

Expensive

Apart from speed, high quality and versatility, laser printers also produce high-resolution images. A good-quality laser printer is a necessity for desk-top publishing, to produce printed matter not far behind typeset material in quality and resolution.

Naturally, you have to pay a price for quality and speed, not only at the time of purchase but for subsequent running expenses. Good laser printers cost upwards of £2,000, though recently some cheaper printers have appeared. Even the cheapest laser printer costs more than £1,000. These printers use toner cartridges instead of ribbons and one of them costs approximately £85. In a busy office, one toner cartridge does not last many days so a laser printer is expensive to run.

With most printers you have to allow for an additional expense. Any computer may drive a printer either through a serial or a parallel connection. Unfortunately, though most printers need a parallel connection, the QL has only a serial interface, two actually, so you may need to purchase a parallel interface. This will cost another £20 or so.

ABC Elektronic

Andreas Budde
Hügelstraße 10-12

4800 Bielefeld 1

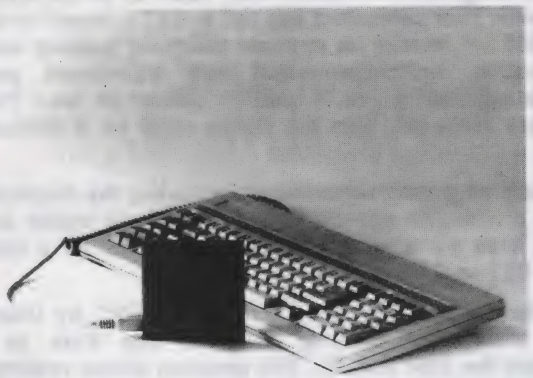
Telefon 0521/ 890381
Telex 932 974 budde d

Telefax 0521/160400

The Giga Soft IBM-Keybord Interface

-the IBM keyboard-Interface is conected to the **QL ROM-Port**. But the user does not lose the possibility to use additional Roms, because of a ROM-socket on the Keyboard interface.

- with the IBM Keyboard Interface it is possible to use any **IBM** or compatibel **PC/ XT** Keybord.
- with the IBM Keyboard Interface the user will have **twice** the input speed of the orignal keybord!
- the IBM keyboard Interface is fully "keyrow" compatible !



Extras:

<-	delete character left
CTRL <-	delete word left (in editors only)
CTRL SHIFT <-	delete whole line (in editors only)
SHIFT <-	cursor to start of line (in editors only)

There are five new function-keys:

F6	SHIFT F1
F7	SHIFT F2
F8	SHIFT F3
F9	SHIFT F4
F10	SHIFT F5
CTRL SPACE	BREAK
SCROLL LOCK	CTRL F5

NUM LOCK toggles the state of the NUMLOCK LED.

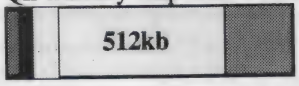
This controls the function of the numerical pad. Is NUMLOCK on, then a keypress on it generates the numbers and characters shown at the keys, otherwise

ARROW KEYS	CURSOR CONTROL
HOME	Cursor to start of line (in editors only)
END	Cursor to end of line (in editors only)
PAGE	UP Scroll up one page (in editors only)
PAGE	DOWN Scroll down one page (in editors only)
DEL	Delete character under cursor
INS	ALT ENTER (with SuperToolkit II)
CTRL -	program slow down
CTRL +	program speed up
SYSREQ	Job-change (function of CTRL C)
CTRL PRTSC	toggles MODE 4 and MODE 8
ALT SHIFT SYSREQ	Level 7 interrupt (CTRL ALT 7 at the QL)
PRTSC	s.u.
ALT SHIFT PRTSC	RESET

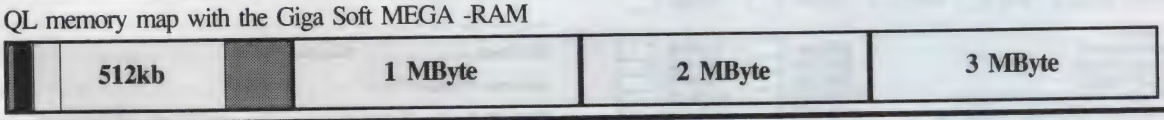
The Giga Soft MEGA-RAM

Thanks to the MEGA-RAM Card it is now possible to use more than **640kb** on the **QL** Computer. MEGA - RAM is a Board that replaces the orginal **68008** CPU and can handle up to **3 MB**. The new CPU on the MEGA-RAM Card is fully compatibel to the **68008** CPU. The command "ramex" makes the additional memory available for use - the normal RAM up to **640kb** can then be used as a RAM Disk. Up to **2MB** it is possible to use the orginal QL case. For the **3MB** Version a new case is required.

QL memory map with **640kb** RAM



QL memory map with the Giga Soft MEGA -RAM



Order form

	Price			
The Giga Soft IBM-Keyboard Interface	**£ 45**	**DM 229,-**		
The Giga Soft MEGA-RAM **1** MB **2** or **3** MB	**£ 266** **call**	**DM 799,-**		

Name and adress

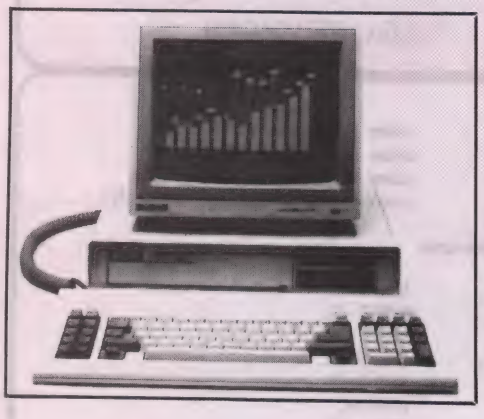
Cheque, credit transfer to Postgirokonto Dortmund Nr. **90283-469**
C.o.D. only Europe (not UK, Greece, Northern Ireland) Accepted, **£**= export prices

CST

CAMBRIDGE SYSTEMS TECHNOLOGY

24 Green Street, Stevenage, Herts SG1 3DS
Telephone: Stevenage (0438) 352150

CST



THOR XVI

The all new CST Thor XVI is a sign of CST's commitment to developing and expanding the QL compatible marketplace and in particular the unique architecture of the operating system. In addition to implementing the full 16 bit bus, David Oliver and his team have gone back to fundamentals to build into the new generation of computers a refined streamlined Qdos compatible operating system: Argos.

While fully compatible with Qdos and the QL, the Thor XVI has enhanced networking, single key multitasking, dynamic ram capability of 6.5Mb with at least twice the performance of the QL. For the professional user there are now 20Mb and the 40Mb hard discs complemented by a choice of either single of dual 3.5" floppy disc drives.

MONITORS

To complete your system, CST can supply a choice of monitors and printers; selected from the wide range on the market, their superior performance and reliability when used with Thor computers has led to CST's recommendation. The compact Philips 7502 12" monitor for example has many features including a dark anti-glare screen, horizontal/vertical size adjustment, position, brightness and contrast adjustment. For 16 glorious colours on you r Thor XVI (in addition to all these features), than the choice must be a Philips 8833 colour monitor.

PRINTERS

CST is pleased to satisfy all printer requirements including the installation of the necessary printer driver. The popular Epson LX 800 dot matrix and the fine letter quality Juki 6100 are quoted on the CST price list, for a quote on other models just call CST on 0438 352150.

DiscOVER

A recent addition to the software for your Thor, "DiscOVER", by Charles T. Dillon, enables the transfer of data or program files from an alien environment to and from the Thor and QL. This program allows reading from and writing to IBM formatted single or double density 40 or 80 track discs. Fully supporting the subdirectory structures standard in MSDOS and PCDOS operating systems, the program allows the individual selection of files, directories or the whole contents of discs.

Please supply:-	UK inc VAT		Overseas	
Qdisc Interface 4 (3.5in. util disc)	£79.95	☐	£72.70	☐
Qdisc Interface 4 (5.25in. util. disc)	£79.95	☐	£72.80	☐
QEP-III Eprom programmer (QL/THOR)	£129.95	☐	£116.00	☐
RAM-plus 512K QL memory	£139.95	☐	£125.20	☐
CST Dual 3.5in. cased floppy discs	£219.95	☐	£200.40	☐
CST Q-488 GPIB instrument interface	£224.25	☐	£198.40	☐
Qdisc 4 + dual 3.5in drives	£275.00	☐	£249.40	☐
Qdisc 4, RAM-plus + dual 3.5in. discs	£405.00	☐	£363.60	☐
QL SPEEDSCREEN 3.5 ☐ 5.25 ☐ mdv ☐	£20.00	☐	£18.00	☐
The Thor XVI Range				
Thor XVI CF (Workstation)	£759.00	☐	£759.00	☐
Thor XVI IF (Single Floppy)	£874.00	☐	£874.00	☐
Thor XVI FF (Dual Floppy)	£989.00	☐	£989.00	☐
Thor XVI W20F (20Mb Winchester, 1 Floppy)	£1679.00	☐	£1659.00	☐
Thor XVI W20FF (2oMb Winchester, 2 Floppies)	£1794.00	☐	£1765.00	☐
Thor XVI W40F (4oMb Winchester, 1 Floppy)	£2969.00	☐	£2316.00	☐
Thor XVI W40FF (40Mb Winchester, 2 Floppies)	£2489.00	☐	£2426.00	☐
Additional RAM for the Thor XVI Range:				
0.5Mb RAM Expansion Card	£179.40	☐	£179.40	☐
For the Thor Range:				
Philips Monitor (Monochrome)	£92.95	☐	£111.40	☐
Philips Monitor (Colour)	£295.00	☐	£300.40	☐
Beige Mouse	£74.75	☐	£72.00	☐
Psion Chess	£24.95	☐	£22.70	☐
INTROM I from Interlogic	£49.45	☐	£44.00	☐
SPEEDSCREEN rom for Thor	£29.90	☐	£27.00	☐
ROM Installation on your Thor	£15.00	☐		
Floppy Discs 3.5", pack of 10	£15.00	☐	£14.00	☐
Additional 12m Service contract (1F&FF)	£100	☐		
Additional 12m Service contract (WF)	£130	☐		
QL Trade-in against Thor Deduct £70 (UK) £60 (O/S) ☐	Export administration Airmail outside Europe		£5.00 £10.00	☐

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Address .....

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SQLW6

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Post Code..... Telephone .....

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Please deduct my Access/Mastercard/Eurocard/Diners Club/Vector a/c

Card No. | | | | | | | | | | | | | | | | |

Expiry Date .....

Signature .....

Access BARCLAYCARD VISA MasterCard DINERS CLUB INTERNATIONAL

Prices are inclusive of carriage
CST reserve the right to alter prices and specifications without prior notice

CST Thor TIMES CST
No. 880309

BROTHER BREAKTHROUGH

CST's Scandanavian distributor Dansoft have announced a joint marketing and sales venture with the printer and peripheral manufacturer Brother International. The agreement, following long and detailed negotiations, covers the promotion of Thor XVI computers in conjunction with Brother HL8 laser printers in integrated systems throughout the Scandanavian sales area.

The campaign will include the production of a joint sales brochure and advertising, a series of seminars to invited audiences in conjunction with the Danish news agency Ritsaus and the demonstration of Thor XVI computers with the HL8 laser printer at the prestigious "Kontrol Data" show in Copenhagen.

ADVANCED

Managers at Brother have been particularly impressed with Dansoft's prestige customer base in both government and industrial circles. In addition their use of sophisticated application software fully utilising the laser printer's advanced features is the best endorsement.

STOCK CLEARANCE BARGAINS AT CST

Space is a valuable resource at CST with sales of the Thor XVI increasing all the time. To make room for further expansion CST are now clearing the last remaining stocks of standard Thor computers. In addition, in keeping with the CST policy of ensuring upgradability to all their customers CST has a trade in offer for all current Thor owners. As a result CST now has reconditioned machines for sale at a 30% discount on the old list price, that's a saving of £241.50 on a twin floppy machine.

RECONDITIONED AND NEW

All models are currently available, both new and reconditioned. The detailed review in the April QL World described the Thor as " . . . without reservation, a superb machine" and now available for just £562.35 for a twin floppy model. Stocks of new machines are strictly limited however so it's first come first served. Phone CST for details

THOR XVI: THE COMMUNICATOR

Firstly, apologies to comms freaks for the delay in this article which was held over due to pressure on space. With the exciting features of the Thor XVI, we are sure it will have been worth the wait!

RS-5/8 SERIAL PORTS

The serial ports on the Thor XVI are completely under the control of the I/O Board's MC6BBO2 processor, relieving the MC68000 Main Processor of the handling overhead. The ports ar implemented using the MC68682 DUART (Dual Asynchronous Receiver Transmitter for acronym buffs) allowing multiple baud rates between channels. For example, port 1 could "talk" to a Prestel type modem running at 75 baud for transmission and 1200 baud for reception by opening a channel called "Set 11/7561200". With port 2 simultaneously driving a standard serial printer at 9600 baud (the default) with a 10 kilobyte buffer as "ser—10K". The baud rates can be selected from: 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 9600 and 19200; CST claim that this should cope with almost all possible configurations!

Other options available are the setting of parity (odd, even, mark, space or none), bits per byte (5, 6, 7 or 8) and translation protocol (various interpretations of newline are supported as is "TRA" for international users). A new facility is the built in support of the x-on/x-off software protocol (as used by DEC, Unix etc) which allows simple three-wire cabling to be used.

Physical connectors and voltage levels are as defined by draft British Standard BS-5/8, which uses audio-style 8-pin DIN connectors for convenience; most applications will only need five of the pins (the remainder providing auxiliary handshake and 5 volt power) and can be connected by "sterio" reversing audio leads; if x-on/x-off is used, as "mono" cable may be used. The voltage levels are CMOS; these can normally be interfaced with the older Rs-232 by means of a simple resistor.

THE NETWORK

The Thor XVI network is upward compatible with the standard Thor's and the QL's. It is again driven by the I/O Board's processor, significantly reducing the main processor overhead; this is particularly important with machines acting as file server, as no network overhead occurs on the new system unless data is actually being transferred.

TO BUY OR TO LEASE?

Leasing, the increasingly popular method of cutting capital outlay, is soon to be offered by CST on purchases of machines from their Thor XVI range. With negotiations currently under way with several leading finance houses CST are confident they will be able to offer the best possible deal to all their customers. The lease purchasing schemes under discussion will suit both business and private interests with varying terms to cater for all budgets. Phone CST on 0438 352150 for further details.

Dear Hilde . . . THOR TIMES AGONY AUNT

Dear Hilde
As an old friend of CST and my namesake Thor I wish you every success with the Thor XVI. Recently I've noticed though that there are companies that want to cash in on your success and on your good name too! How are you going to fend these userpers off? I think we should be told!

Thor S Day

Dear Thor
We've heard of a US company. Danty I think, who plan to manufacture "Thor" CD rom readers. This blatent attempt to ingratiate themselves has not influenced CST however and the decision is still open as to which rom reader to incorporate in future systems. Don't forget, only genuine CST products carry the Thor's lightning bolt.

Hilde

Next Month: THOR INTERNATIONAL

AI DRAUGHTS

Marcus Jeffrey adds a tree-search to his artificial intelligence program

At the end of the previous article we had completed a program which would make intelligent decisions concerning its next move. Unfortunately, those decisions tended to show only a very basic intelligence. In this article we will add a tree-searching strategy to the program which will allow it to assess future projections on the play of the game. This should allow the program to play better moves by anticipating its opponent's replies.

Before we begin, there was a slight problem with the last listing — March 1988, page 48 — where a few lines were omitted from the start. They are shown in Figure 1 and you should add them to your program and verify that everything is working correctly before continuing.

Our present program does not play a very good game because it considers the position only once it has made its move, evaluating this using our material, advance, centre and 'fork' functions. These functions, to a limited extent, attempt to prevent the program making stupid moves but, because of their lack of foresight, they often fail.

The answer is to give the program the ability to consider all the possible replies to any of its initial moves.

Figure one

```
3200 :
3210 DEFine FuNction find_move(b,col)
3220 LOCal j,board(45)
3230     FOR j = 1 to 45 : board(j) = b(j)
3240     ft = top : generate_moves col : lt = top
3250     pres = ft : high = -9999
```

Figure two

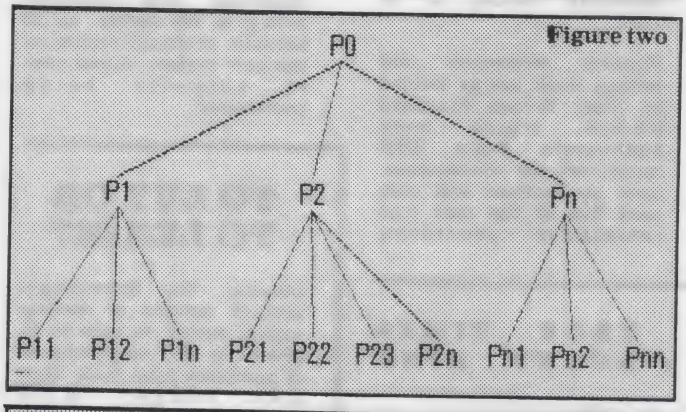
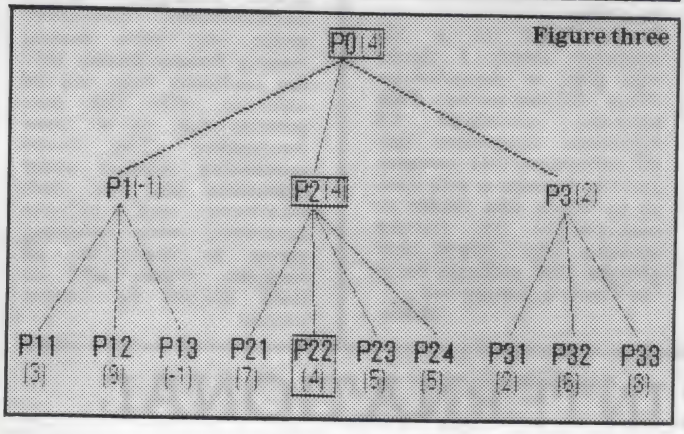


Figure three



This is known as a two-ply search, a ply merely being a move by either player. This form of search is often referred to as a minimax three search, because the minimum and maximum scores are backed up the tree alternately.

A representation of the tree for our two-ply search is shown in Figure 2. PO is the current position where the computer has to make a decision between the moves leading to the positions P1 to Pn. At the moment, our program evaluates each of the positions P1 and Pn and takes the highest of them. What we are proposing is that the possible replies by the opponent — in this case the player — are also considered. So, for position P1, the replies P11 to P1n are generated and evaluated, and so on.

Now for those positions. P11 to P1n, the player obviously will choose the best, which will be the worst from the computer view and is therefore assumed traditionally to be the lowest score. You may notice that our program does not play like this; the evaluation functions return a high score if the position is good for the current colour, 'col', though it would be very easy to use high/low scores by multiplying the returned values by 'col'.

If the computer were to make the move P1 it could expect the opponent to make the move leading to the lowest evaluation of P11 to P1n. Therefore it seems sensible to assign the lowest score from P11 to P1n to the position Pn and we will obtain a list of minimum values. Obviously the program wants to choose the highest of these minimua, so the maximum value from P1 to Pn is backed-up to the position PO. This is the move the program will play.

In simple terms, this shows how the Minimax Look-Ahead Algorithm works. As another example, Figure 3 shows the same procedure using actual values, with the chosen route highlighted.

We now have only to solve the original problem — the program lacks foresight. Our program is admittedly better than it was but it is ignoring any of its possible replies to the opponent's moves. The easiest solution is to increase the tree search to three-ply — the program's moves, the opponent's replies, and the program's replies to these. What about the opponent's replies to these moves? Obviously we could go on forever, or at least until the game ends, at which point it would be possible to assign a score of '1' for a program win —1 for a player win and '0' for a draw. By backing these values up the tree the program would be able to play perfectly.

Unfortunately, this level of search is not possible. Let us assume that we average, say, eight possible moves from any position. So when we evaluate moves at the first play — i.e., P1 to Pn — we have only to evaluate eight positions; you already have some idea of how long this takes in SuperBasic. If we were to search to two-ply, e.g., P11 to Pnn — we would have to evaluate 8x8 or 64 positions. At three-ply we would evaluate 512, at four-ply there would be 4,096, then 32,768, and by six-ply we would have to consider 262,144 positions. If you do not mind playing one move per day, perhaps this kind of search would be possible in SuperBasic but it really requires machine code.

It is because of this exponential growth that no program has yet been able to achieve the position of chess world champion. As an indication of how important this tree-searching is, the best programs tend to be those which search as far as possible in their limited time, rather than trying to imitate human thought processes.

Obviously we have to terminate the tree search at some point. In our program we will be using a combination of termination methods. To begin, we will always search to at least three-ply, which should

give the program limited foresight. Having reached that depth, the lookahead will terminate only in stable — known as 'quiescent' — positions. In our program this is achieved by generating the next level and checking for any 'jump' moves. If none is available the position is quiescent and the search terminates.

This simple search of just three-ply or so already slows the program dramatically and anybody with a compiler could make good use of it but there is a software method we can use to reduce our search time, known as the Alpha-Beta algorithm.

To see how this works, imagine the tree in Figure 4. Using our normal minimax tree search, the program would have to evaluate all eight of the two-ply positions, obtaining the results 3, 7, 2, 4, 6, 5, 1 and 8. The minimum of each of these has been backed-up the tree to give 3, 2 and 1. Then the maximum of these — the 3 — has been backed-up to position PO as the move which will be chosen.

Let us imagine that the computer has already expanded positions P11 and P12, obtained the scores and backed-up the minimum — the 3 — to position P1. The next position it evaluates will be position P21, obtaining the result '2'. Let us consider what will happen regardless of the results obtained from P22 and P23. We will back-up the minimum value to position P2, which will be '2' or less, whatever the case.

When we take the maximum of the positions P1 to P3, we will never choose P2 because we already know that it will have a lower value than the '3' at P1. Consequently, we have no need to evaluate the positions P22 and P23. Nor do we have to back-up the score of '2' to position P2. Instead we continue by examining P31. This gives us a value of '5', so we continue by evaluating P32. Here we get a value of '1', which is lower than our '3', so we can stop and need not evaluate position P33.

This has resulted in only five positions being evaluated instead of the original eight, so it must be considered a significant saving. We were comparing our newly-evaluated values to a mimimum value — the '3'. Obviously at the next ply we can carry-out the same operation against a maximum value, and so on at each level. In effect, the Alpha and Beta values are acting as a window on to the range of scores which we will deem to be acceptable.

The Alpha-Beta algorithm works best when the positions at each level are sorted into their best order. If this is done, the algorithm will reduce the search to the square root of the terminal nodes. If we imagine our six-ply search generating 262,144 sorted positions, the Alpha-Beta algorithm would reduce this figure to only 512 positions, a much more manageable amount.

Many programs which make use of this algorithm have two evaluation routines. The first is a very fast and crude evaluation designed to sort the positions into a better order. The second routine takes over to assign values to the positions. In this way the first routine would have allowed the machine to make better use of the Alpha and Beta values to reduce the search.

The program listing, in Figure 5, is not very long this month. Note that some of the lines are duplicates of ones already in the program. They represent a few amendments for our new routines. For instance, the call to minimax rather than 'find—move', which is no longer used.

Load the previous program, type-in the lines as shown, save and run. Bear in mind that the program will now be very slow because of its increased search. Anybody with a compiler would be advised to use it. I have explained how the search depth is controlled — set depth plus non-quiescent positions. It is very easy to alter this depth by changing the third line of the 'REPeat scan—moves' loop in the minimax routine.

● *In the next article we will conclude the series with a brief foray into how machine learning can help to improve program performance.*

Figure four

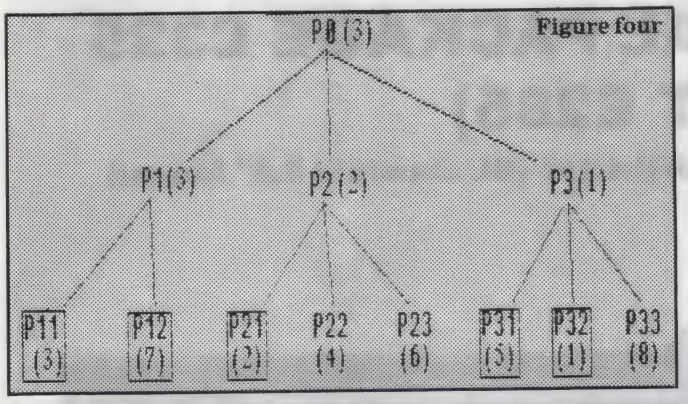


Figure five

```
100 REMark ** AI DRAUGHTS **
110 REMark ***  PROGRAM  ***
120 :
130 init_constants
140 init_vars
150 init_board
160 REPeat loop
170   print_board
180    FOR i = 1 TO 15:ab(i)=-9999*(2*((i MOD 2)=1)-1)
190   top=1:sc = minimax(board,black,1)
200   make_move best
210   input_move(white)
220 END REPeat loop
230 :
240 REMark *******************************
250 :

1100    DIM board(45),move_list(500)
1110    DIM m(6),wg(4),ab(15)

4110 :
4120 DEFine FuNction minimax(b,col,level)
4130 LOCal j,board(45),ft,lt,score,high,pres
4140    FOR j = 1 TO 45 : board(j) = b(j)
4150    ft = top : generate_moves col : lt = top
4160    pres = ft : high = -9999
4170    REPeat scan_moves
4180       IF pres >= lt THEN EXIT scan_moves
4190       make_move pres
4200       IF (level>=1) AND (level MOD 2)=1 AND quiescent THEN
4210          score = evaluate(col)
4220       ELSE
4230          score = minimax(board,-col,level+1)
4240       END IF
4250       IF score > ab(level) THEN ab(level)=score
4260       IF score > high THEN
4270          high = score
4280          IF level = 1 THEN best = pres
4290          IF level>1 THEN IF high<ab(level-2) THEN RETurn high
4300       END IF
4310       pres = pres + move_list(pres)
4320       FOR j = 1 TO 45 : board(j) = b(j)
4330    END REPeat scan_moves
4340    RETurn high
4350 END DEFine minimax
4360 :
4370 DEFine FuNction quiescent
4380 LOCal t_top
4390    t_top = top : generate_moves -col : top = t_top
4400    IF move_list(top)=3 THEN
4410       RETurn TRUE
4420    ELSE
4430       RETurn FALSE
4440    END IF
4450 END DEFine quiescent
```

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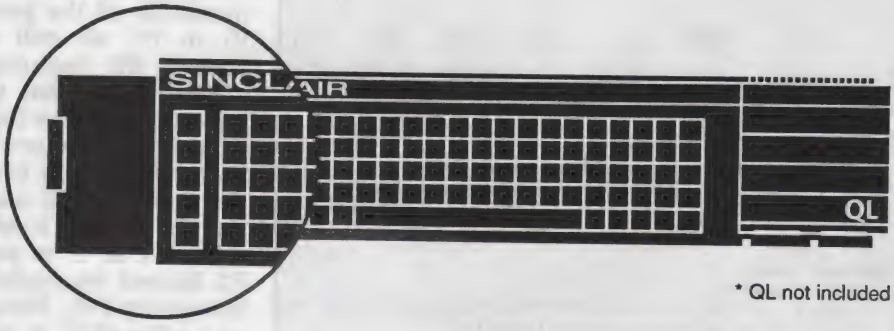

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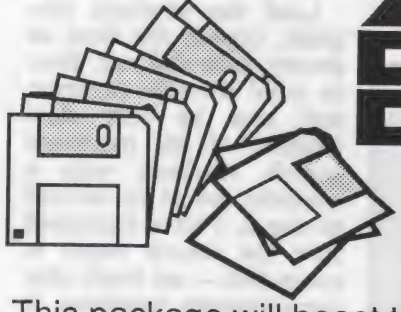

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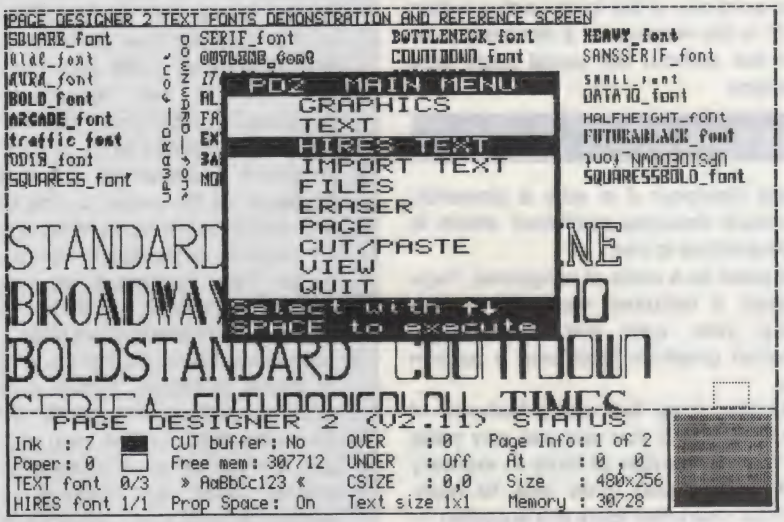


Ron Massey justifies his existence with two new page management programs.

One of the principal limitations of the majority of word processors is that they are restricted to a single page column. There is no easy way to produce a document in a multi-column format unless you use the DP *The Editor* and a command file or a desk-top publishing program.

If you also plan to include any kind of graphics, even if only for simple decorative boxes or borders, the only option open to you is a desk-top publisher. Once you have entered the world of publishing, however modest, the current range of dedicated QL programs will allow you to develop exceptional page designs limited only by your imagination.

Although the QL desk-top publishers have both drawing and text editing facilities built into them, they are usually classed neither as word processors nor graphics programs. More accurately, they can be considered as page managers.

The first QL desk-top publishers, *Front Page* and *Front Page Extra,* from GAP Software, and the Digital Precision *Desk-top Publisher* were reviewed in the August, 1987 issue of *QL World.*

Both programs also allow you to add illustrations derived from other sources — any standard screen file; DP DTP will also allow you to use compressed images produced by *Eye-Q* — and edit them, in terms of re-colouring or selecting a small area of an illustration.

Although not aimed specifically at desk-top publishers, this report concerns new programs which can provide you with advanced tools to produce copy.

Text87

One of the newer additions to the QL armoury of text-only programs, *Text87,* is a flexible word processor adaptable to a wide range of documents.

Among its many features is a facility to use custom fonts, five of which are included in the program suite. The *Quill* uses non-standard fonts to indicate sub- and super-script. Although Text87 uses a similar technique you have the option of using custom fonts to represent typeface changes and improve screen legibility.

My first impression of the default font was that the small characters were reasonably legible on a monitor, although I imagine this is not the case on a TV.

A wide range of controls is available for virtually every text editing requirement, from labels and mail merging to exceptionally large documents.

Although supplied on a rather full disc or several Microdrive cartridges, only three files are required to get the program under way — the Text87 program, the default font file and one of the eight printer drivers supplied.

Irrespective of the font and/or typeface selected, the right margin is always honoured. If, for example, you have selected right justification, you can have any combination of typefaces on a single line as required. While the display may appear left-justified, the final printout will be, if selected, right-justified.

When up and running, navigation through the Text87 menu system is, with few exceptions, self-explanatory. It is considerably faster than Quill for most of its functions. Most of the speed improvements are derived from sensible compromises in screen and memory management. Document information such as word count is updated with every line feed — either whenever <ENTER> is pressed, on a screen refresh — by pressing <F4> — and whenever a wordwrap occurs.

Pressing <F3> accesses the uppermost command level of the Main Menu which, after selecting the first letter of an option, offers you a range of related sub-options.

Text formatting, in terms of justification, margins, tabs and line spacing, is done by pressing <F3> and <R> — for RULER. The ruler option is probably one of the most distinctive departures.

Similarly to a typewriter, Quill uses a character ruler at the top of the page. Quill tab settings are indiciated on a separate sub-ruler.

Text87 uses one or more separate individually-selectable rulers to store tab positions and their types, margins, line-spacing and justifications. Up to 64 rulers can be selected.

When you ask for a word search, you are offered the option of searching for a previously-defined word, "old string", or "new string". Unlike Quill, the search function is very fast and starts from the current cursor position.

One of the powerful Text87 features which appealed to me was its file handling structure. Text87 documents can be saved in one of several formats; the T87 format includes the way each document line is formatted, the rulers governing text format, cursor position and line number when the document is saved; the L87 format is created with the Export option including text and tab marks only. This option is intended for moving blocks of text from one document to another. Text-only files can adapt any format.

Quill —doc files can be imported into Text87, although document formatting may require adjustment.

Text87 is aimed at non-technical users. Hands-on experience largely substantiated this. Some of the options appeared more complicated than they should have been but, in practice, this proved not to be the case.

According to the manual, a number of facilities included in the menu for user interface consistency have not yet been implemented. One such option is ALPHA, toggling an additional keyboard and normal character set. Also awaiting implementation is the DOC option which will be available in a future multi-document version of Text87.

Reported enhancements being developed for future releases include a larger range of dedicated printer drivers

for 24-pin and laser printers. An important new option being developed and scheduled for release in late June is an add-on printer driver and more than 10 character sets. This addition will allow you to print any of the fonts usable within Text87 in the manner of a desk-top publisher but without the usual page size limitations.

PAGE DESIGNER 2

Page Designer 2 is now a powerful, full-feature desk-top publisher which is simple and fast to use.

Supplied as a suite of programs, Page Designer 2 includes modules for designing your own text fonts, high-resolution graphics fonts and a pattern editor.

Selecting from the many features of Page Designer 2 you can use any page size, have a number of fonts in memory — 34 normal text fonts and 10 high-definition character fonts are supplied — mix text and graphics freely, modify image colouring — either re-colour or de-colour — use any of the eight QL character sizes and use any combination of normal or inverse video.

The program is entirely menu-driven; you select by moving a bar on a menu and pressing <SPACE>↑ Each main option produces sub-menus.

Up to nine pages, memory permitting, may be defined and, if you use elements of a page design frequently, you can produce a template and use the COPY PAGE option to duplicate your layout.

Even though Page Designer 2 does not purport to be a graphics program; a number of graphics routines are available in the program. Most significant is the CUT and PASTE facility.

Template

Pages may be saved as normal screen files or compressed. Graphics images may be produced from one of the dedicated graphics programs, such as DP Eye-Q, or from a video digitiser, such as the SPEM unit. Alternatively, you can use images from the Sector *Clipart* or the TK Computerware *Paste Art* systems.

You also have the option either of saving a whole page or selecting SAVE PAGE SECTION. The latter allows you to change page sizes for later use.

Since the final product will be a printed page, Sector Software has taken considerable care to ensure that you will have an adaptable printer driver.

As supplied, the Page Designer 2 printer driver will work with Epson FX80/ Centronics GLPII or similar compatible printers, with most 8-pin and some 24-pin graphics printers. If your printer does not fall within this broad range of types, you will have to modify the supplied driver to suit your particular printer using the INSTALL—bas utility.

Graphics printer drivers include five considerations:

1. Graphics mode; a code sequence specifying the number of dots contained in an 8in. line. Commonly, these may be 480, 640, 720 or 960 dots per line. Some printers are capable of 1,920 dots per line but this is not recommended because it compresses the screen image horizontally when printed.
2. Graphics line-spacing; the vertical transport of the paper during printing, ensuring correct joining of rows on successive passes of the printer head. The increment is usually specified as n/72, n/144 or n/216, where n = the vertical dot pitch.
3. Multi-pass line-spacing; the amount of paper is moved before successive passes of the printer head. Normally this is set to zero but you can choose up to 10 passes of the printer head to improve print quality. Alternatively, you can move the paper very slightly so that the dots overlap, which has the effect of closing very line changes of texture between each line.
4. End-of-line code, if you select multi-pass line-spacing and move your paper slightly, you may need to use either a carriage return code, chr$(13), a linefeed, chr$(10), or both.
5. Normal graphics linefeed; under some circumstances these codes will be the same as number four.

The easiest way to build a printer driver suitable for your needs is to experiment with various combinations available, using educated guesses as your starting points.

Four blank template files are supplied in compressed format which will allow you to set up a PD2 page easily without having to refer to the settings required — standard A4, American quarto fanfold printer paper, QL screen-sized pages and the recommended 784 x 800 pixel pages — for using the Sector laser printer service.

By the time this report is published, Sector Software will have included a particularly important new facility. You will have the option of defining a "protected" page area during text import. In practical terms; this means that you can reserve an area on a page and that, during text import, characters will flow around a preserved area into which you can later add illustrations.

Strictly speaking, Eidersoft *Pagemaker Off-ICE* is not a desk-top publisher intended to be used for the manipulation of text and drawings derived from other programs. Using the suite of programs supplied with its mouse system, Pagemaker is designed to produce pages directly.

The Pagemaker suite is run as a group of tasks, each of which accesses RAM disc files produced by the suite. This enables you to load program modules, modifying particular files progressively.

All the principal menus in the progams are mouse-driven. When up and running, you are presented with eight options from the task menu — 3D graphics, 2D graphics, char block, files, text, articed, ICE and printer.

Each task uses its own menuing system. The 2D and 3D graphics utilities each have two menus — the main menu for selecting basic geometry and a second menu for selecting the tools for manipulating the shape selected.

The main menus consist of:

3D Graphics:

- Block — printed centrally in the screen in perspective.
- Triangle — in three dimensions.
- Lens — comprising of two horizontal lines and two vertical arcs.
- CLscreen — clears the current screen.

2D Graphics:

- Line — rubber banded.
- Arc — also rubber banded.
- Rectangle.
- Circle.
- Triangles.

Both these graphics utilities include a range of manipulation directives including tilting, rotation, solid or wire representation and re-positioning. The char block facility enables you to design a block of text or UDG characters. Text is used in one of three modes; typewriter, which simulates a typewriter working to full page width; columns, for text input into pre-defined columns; and character, specifically for UDG characters.

ArtICEd is the very much under-rated drawing program from Eidersoft. This version of ArtICE differs from the program available separately only in that it defaults to mode4 on start-up. The files facility enables you to load and save screen and page files.

The version of Pagemaker supplied for review was in a very undeveloped stage but proved compatible with my Canon Epson-compatible printer. It provided very high quality A4 fanfold printout, with automatically-set margins.

Under-rated

Few other computer systems have the number of quality page editing programs of the QL. It is too easy to criticise new text editors; computer users often prefer the features on the first word processor they learned to use by which other similar programs are judged.

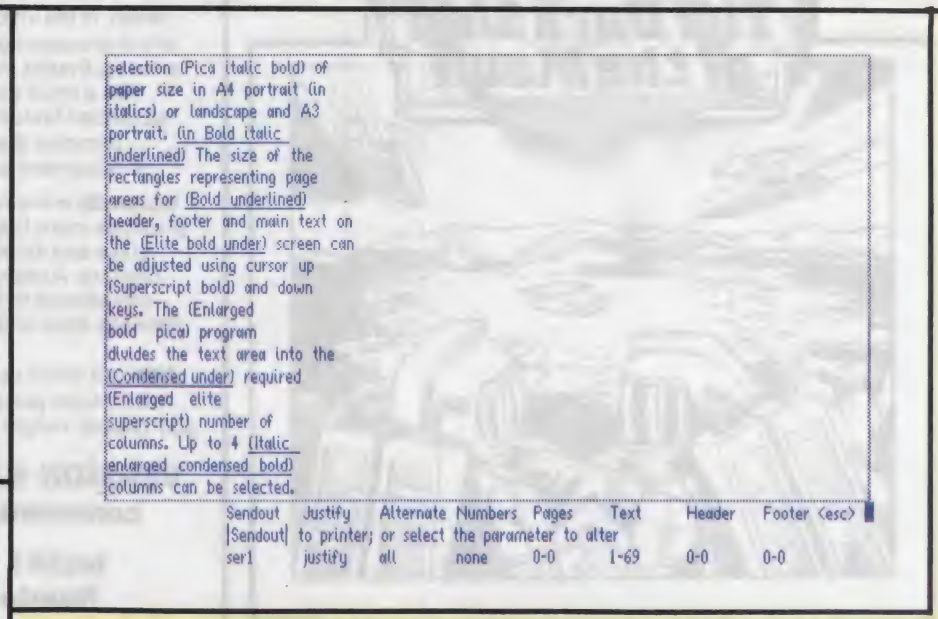
The majority of Text87 features are self-explanatory. If you are Quill-orientated you could find that Text87 needs a short period of re-adjustment.

With hands-on experience, Text87 is

Top right: The screen layout of the printed copy shown below on the left, from Text87.

Below left: A selection of typefaces supplied with Text87, mixed freely in one paragraph.

Below right: A screen dump from Page Designer.



what I can only describe as a "thinking person's word processor." It will prove to be one of the most flexible and powerful dedicated word processors yet produced for the QL.

The version reviewed for this report is the second official release and has left me with a clear idea of the direction in which the author intends to take the program. It is very impressive. Obviously, Text87 will be developed further, as are the majority of good programs, for a considerable time.

In common with my criticism of an earlier release of Text87, I felt that, if the portion of the manual supplied with the review program was representative, it would have been better-aimed towards the type of user most likely to be using a word processor who is often a first-time computer user.

Page Designer 2 is supplied as a complete system. The Microdrive version is on five cartridges — two for programs and three for fonts, examples, demos and updates. Other add-ons include files of clip-art and an image enhancer for modifying graphics files — drawings or digitised images.

Page Designer 2 is particularly easy to use and, with the exception of text input, requires very few keypresses.

The Page Designer system has been designed for ease of use. Without assuming previous experience with a desk-top publisher instructions take you through what could be confusing technical terms painlessly.

A large section of the manual is devoted to printing. Acknowledging the fact that many users have difficulties with building drivers for non-Epson-compatible printers, Sector has reduced potential problems to easily-manageable proportions.

Most certainly the Eidersoft Pagemaker Off-ICE deserves more attention than it has received so far; Off-ICE includes many features found only in sophisticated CAD programs and, because of this, you can produce both general and highly-technical pages with equal ease.

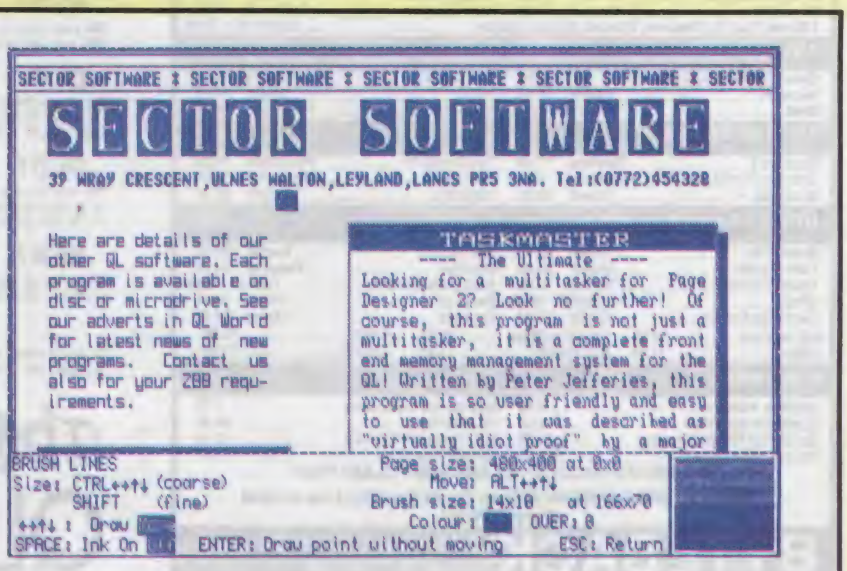
As a working system, it provides virtually all the tools needed to produce as much detail as you need in a wide range of design requirements.

I recommend that new users practise with Off-ICE before attempting to use it in earnest. I have only two minor criticisms of the program; the first is that what a few of the options do is not readily apparent.

Although the instructions provided with the version of the program received for review were in the form of abbreviated documentation notes, most of the program proved fairly easy to get to grips with.

My other criticism of Off-ICE is that it tends to be somewhat slow in some of its operations. Having said that, few people can use the speed of an arcade game to design artwork.

One of its program modules is available as a stand-alone package. I have always liked ArtICE which, in addition to being one of the better drawing programs for the QL, surprisingly has escaped being reviewed, in spite of the fact that it has been available for some time.



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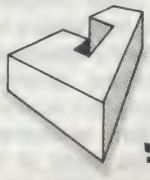

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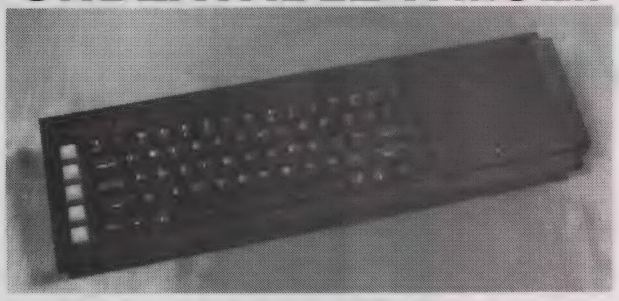

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Program of the month

TAKTIX by NIGEL D. FORD

This is a tactical battle game in SuperBasic for the 128K or larger QL in television mode. Up to six can play. In theory, as many as 19 people as well as the computer can play but some player inevitably would be eliminated before the first turn. The computer can play by itself if no human players are selected.

Twenty European countries are displayed on a map and the number of troops in each is shown at the side of the screen. Each player is given some extra troops to place at the beginning of his turn. He can then decide to attack neighbouring countries or let the next person have a turn.

Large empires are shown in differing blocks of colour on the map but it may not be wise to spread troops to thinly. Kamikaze tactics may shorten the game but expect to be playing for more than an hour. The computer will play one country with a relatively simple but effective strategy and may well be the winner. The game finishes when one player has eliminated all the others.

To play the game, insert the cartridge into Microdrive 1. Press F2 to select TV mode and then type in LRUN MDV1-TAKTIX. This may be done automatically. Read the instruction page and then press SPACE.

To select countries, each player in turn presses the appropriate letter for the country with which he wants to start. The country name should now be highlighted in that player's colour. It is a good idea if the countries are not geographically adjacent. When all the players have made a choice, press the ESC key and the computer will select a country, usually the U.S.S.R., to play.

At the start of each turn you are given more troops to place. If you have only one country this will be automatic. Otherwise you should select the placings by pressing the appropriate letter and typing-in the number of troops. You may place them in any or all of your countries. The figures at the right of the screen will be adjusted. When all the troops have been placed you are given four options. Press the appropriate function key:

F1 QUIT ends your turn and prepares for the next player.

F2 ATTACK: If you think you are strong enough to attack a neighbour, indicate which one by pressing the letter key of the victim country and then your own. Attacks can be made across any land border or sea routes marked by a blue line.

F3 FIGHT: After an attack has started, troop numbers on both sides will be reduced. Normally the battle will stop to give you another chance to quit or attack somewhere else. This is the option if you wish to continue fighting. If you are successful you will have to transfer some troops into the new territory. A warning is that defenders have a strong home advantage.

F4 MOVE allows you to move troops from one country to another but they must be adjacent and occupied by you.

Local rules

Players may agree other rules, for example not attacking on the first round or not transferring more than once during a turn. This will not affect the computer and the computer may break them during its own turn.

```
100 REMark taktix
110 REMark
120 REMark N.D.Ford
130 REMark
140 REMark October 1987
150 REMark
160 REMark European war
170 instructions
180 variables
190 screens
200 game
210 DEFine PROCedure instruct
ions
220    PAPER 0:MODE 8
230    WINDOW 512,256,0,0:CLS:
CSIZE 3,1
240    AT 2,9:PRINT 'European
War':CSIZE 2,0
250    PRINT \\'The object of
the game is to take over allt
he countries in Europe.'\\'Ea
ch country has a letter code
as shown onthe map.'\\'Apart
from each player the computer
 will  also take one country.
'
260 END DEFine
270 DEFine PROCedure variable
s
```

```
280   DIM troops(20),country$
(20,15),WHO(20),route$(20,20)
290   RESTORE 290:FOR c=1 TO
20:READ route$(c),country$(c)
:troops(c)=RND(999)
300   PLAYER=0
310   KEY$='ABCDEFGHIJKLNPRST
UWY'
320   number_of_players
330 END DEFine
340 DEFine PROCedure STATUS
350   CLS#4
360   FOR c=1 TO 20:STATS c
370 END DEFine
380 DEFine FuNction COUNT(N)
390   LOCal TOTAL
400   TOTAL=0
410   FOR c=1 TO 20
420     IF yours(c,N):add TOT
AL,1
430   END FOR c
440   RETurn TOTAL
450 END DEFine
460 DEFine PROCedure add(VAR,
AMOUNT)
470   VAR=VAR+AMOUNT
480 END DEFine
490 DEFine FuNction mine
500   LOCal temp
510   REPeat in
520     temp=WHERE
530     IF yours(temp,PLAYER)
:RETurn temp
540     BEEP 999,99
550   END REPeat in
560 END DEFine
570 DEFine FuNction theirs
580   LOCal temp
590   REPeat in
600     temp=WHERE
610     IF NOT yours(temp,PLA
YER):RETurn temp
620     BEEP 999,99
630   END REPeat in
640 END DEFine
650 DEFine PROCedure number_o
f_players
660   PRINT#0;'      PRESS AN
Y KEY TO CONTINUE':PAUSE
670   CLS
680   FOR c=1 TO 20:display c
690   PRINT#0;"Press a letter
 for each new player      or
'ESC' after the last one"
700   players=0
710   REPeat loop
720     a$=INKEY$(-1):
730     IF a$=CHR$(27) OR pla
yers=18:EXIT loop
740     a=a$ INSTR(KEY$):IF a
 AND WHO(a)=0:BEEP 999,5:add
players,1:WHO(a)=players:disp
lay a:ELSE BEEP 999,250
750   END REPeat loop
760   R=18
770   REPeat COMP
780     IF WHO(R)=0:WHO(R)=pl
ayers+1:display R:EXIT COMP
790     R=RND(20)
800   END REPeat COMP
810 END DEFine
820 DEFine PROCedure game
830   REPeat FOREVER
840     CLS#0
850     TERN
860   END REPeat FOREVER
870 END DEFine
880 DEFine PROCedure TERN
890   chosen=0
900   add PLAYER,1:IF PLAYER>
players+1:PLAYER=1
910   PRINT#0;\\'Player no'!P
LAYER
920   cnt=COUNT(PLAYER)
930   IF cnt=0:PRINT#0;'Wiped
 out':RETurn
940   IF cnt=20:PRINT#0;'GAME
 OVER':RECOL 7,6,5,4,3,2,1,0:
STOP
950   more_troops
960   IF PLAYER>players
970     computer:RETurn
980     ELSE
990     REPeat place
1000      PRINT#0;'You have'
!extra!'more troops to place'
1010      IF single:EXIT pla
ce
1020      PRINT#0;'Place in
';:land=mine:PRINT#0;country$
(land)
1030      INPUT#0;'Number of
 troops'!no$:CLS#0
1040      no=0&no$
1050      IF no<=extra
1060        add troops(land)
,no
1070        STATS land
1080        add extra,-no
1090      END IF
1100      IF extra=0:EXIT pl
ace
1110    END REPeat place
1120  END IF
1130  action
1140 END DEFine
1150 DEFine FuNction yours(c,
y)
1160   RETurn WHO(c)=y
1170 END DEFine
1180 DEFine PROCedure screens
1190   PAPER 0
1200   OPEN#3,scr_448x10a32x6
:OPEN#4;scr_90x200a420x16:INK
#4,7
1210   FOR ch=0 TO 4:CLS#ch
1220   WINDOW 420,200,0,16
1230   europe
1240   STATUS
1250 END DEFine
1260 DEFine FuNction WHERE
1270   REPeat TRAP
1280     K$=INKEY$(-1)
1290     K=K$ INSTR KEY$
1300     IF K:EXIT TRAP
1310   END REPeat TRAP
1320   RETurn K
1330 END DEFine
1340 DEFine FuNction connecte
d(a,b)
1350   IF route$(a,b)>0:RETur
n 1
1360   PRINT#0;'These countri
es are not connected'
1370   BEEP 9999,99
1380   RETurn 0
1390 END DEFine
1400 DEFine FuNction num$(N)
1410   RETurn FILL$(' ',5-LEN
(N))&N
1420 END DEFine
1430 DEFine PROCedure display
(place)
1440   AT place,15
1450   PAPER WHO(place)
1460   PRINT KEY$(place)!coun
try$(place)
1470 END DEFine
1480 DEFine PROCedure action
1490   BEEP 999,5
1500   IF PLAYER>players:RETu
rn
1510   REPeat ACT
1520     PRINT#3;'F1-QUIT  F2
-ATTACK  F3-FIGHT  F4-MOVE'
1530     K=CODE(INKEY$(-1))
1540     BEEP 99,9:CLS#3
1550     SELect ON K
1560       =232:EXIT ACT
1570       =236:ATTACK
1580       =240:FIGHT
1590       =244:TRANSFER
1600     END SELect
1610   END REPeat ACT
1620 END DEFine
1630 DEFine PROCedure ATTACK
1640   CLS#0
1650   PRINT#0\\'Attacking ';
1660   deff=theirs
1670   PRINT#0;country$(deff)
\'     from ';
1680   att=mine
1690   PRINT#0;country$(att)
1700   chosen=1
1710   FIGHT
1720 END DEFine
1730 DEFine PROCedure FIGHT
1740   IF NOT chosen:PRINT#0\
\;"No countries selected"\\"P
ress F2 to start attack"\:BEE
P 999,250:RETurn
1750   IF NOT connected(att,d
eff):RETurn
1760   FOR kill=1 TO RND(20 T
O 50)
1770     IF RND(2):dead=att:E
LSE :dead=deff
1780     add troops(dead),-RN
D(9)-1:BEEP 99,99+dead
1790     IF troops(dead)<1:tr
oops(dead)=0:captured:RETurn
1800     STATS dead
1810   END FOR kill
1820   AT#0,1,25:PRINT#0;num$
(troops(deff));' ':AT#0,2,25:
PRINT#0;num$(troops(att));' '
1830 END DEFine
1840 DEFine PROCedure capture
d
1850   CLS#0:STATS dead
1860   PRINT#0;country$(dead)
!'has surrendered'
1870   chosen=0
1880   IF dead=att:live=deff:
ELSE :live=att
1890   WHO(dead)=WHO(live)
1900   PRINT#0;'Transferring
to'!country$(dead)\'
  from'!country$(live)!:IF PL
AYER<players+1:INPUT#0,' ';t$
:t=0&t$:ELSE :t=INT(troops(li
ve)/2)
1910   add troops(dead),t:STA
TS dead:chart dead
1920   add troops(live),-t:ST
ATS live
1930 END DEFine
1940 DEFine PROCedure TRANSFE
R
1950   PRINT#0\\'Transferring
 to  ';
1960   dest=mine
1970   PRINT#0;country$(dest)
\'          from  ';
1980   from=mine
1990   PRINT#0;country$(from)
2000   IF NOT connected(from,d
est):RETurn
2010   INPUT#0;'Number of troo
ps'!no$
2020   no=0&no$
2030   IF no>=troops(from):RET
urn
2040   add troops(dest),no:add
 troops(from),-no
2050   STATS from:STATS dest
2060 END DEFine
2070 DEFine PROCedure STATS(z)
2080   AT#4;z-1,0
2090   colours WHO(z)
2100   PRINT#4;KEY$(z);num$(tr
oops(z))
2110 END DEFine
2120 DEFine FuNction single
2130   F COUNT(PLAYER)=1
2140     FOR c=1 TO 20
2150       IF yours(c,PLAYER):
EXIT c
2160     END FOR c
2170     PRINT#0;'Placing in'!
country$(c)\\
2180     add troops(c),extra:e
xtra=0
2190     STATS c
2200     RETurn 1
2210     ELSE
2220     RETurn 0
2230   END IF
2240 END DEFine
2250 DEFine PROCedure chart (c
)
2260   INK WHO(c)
2270   fil=1:FILL 1
2280   map c
2290   FILL 0:fil=0
2300   INK 7
2310   map c
2320   OVER -1
2330   PRINT KEY$(c):OVER 0
```

```
2340 END DEFine
2350 DEFine PROCedure more_tro
ops
2360   extra=RND(300*COUNT(PLA
YER))
2370 END DEFine
2380 DEFine PROCedure computer
2390   PRINT#0;'You have'!extr
a!'troops to place'
2400   REPeat reinforce
2410     IF single:EXIT reinfo
rce
2420     FOR c=1 TO 20
2430       IF yours(c,PLAYER)
2440         FOR N=1 TO 20
2450           IF extra<1:EXIT
 reinforce
2460           IF route$(c,N)
2470             IF NOT yours(
N,PLAYER)
2480               IF extra>10
0:num=100:ELSE num=extra
2490               add troops(
c),num
2500               add extra,-
num
2510               PRINT#0;num
$(num)!'troops to'!country$(c)
2520               STATS c
2530             END IF
2540           END IF
2550         END FOR N
2560       END IF
2570     END FOR c
2580   END REPeat reinforce
2590   FOR c=1 TO 20
2600     IF yours(c,PLAYER)
2610       FOR N=1 TO 20
2620         IF route$(c,N)
2630           REPeat invade
2640             IF yours(N,PL
AYER)OR troops(c)<4*troops(N):
EXIT invade
2650             CLS#0
2660             PRINT#0\\'Att
acking'!country$(N)\'     from
'!country$(c)
2670             att=c:deff=N:
chosen=1
2680             FIGHT
2690           END REPeat inva
de
2700         END IF
2710       END FOR N
2720     END IF
2730   END FOR c
2740 END DEFine
2750 DEFine PROCedure colours(
q)
2760   PAPER#4,q
2770   SELect ON q
2780     =5,6,7,13,14,15:INK#4
,0
2790     =REMAINDER :INK#4,7
2800   END SELect
2810 END DEFine
2820 DATA '2011000110000000001
1','AUSTRIA'
2830 DATA '0200330003303000000
0','BRITAIN'
2840 DATA '1021000100000100010
0','CZECHOSLAVAKIA'
2850 DATA '1012010001100100001
0','GERMANY'
2860 DATA '0300210030000000000
0','SPAIN'
2870 DATA '0301120011000000001
0','FRANCE'
2880 DATA '0000002030010000100
1','GREECE'
2890 DATA '1010000200000010010
1','HUNGARY'
2900 DATA '1000313020000000001
1','ITALY'
2910 DATA '0301010002100000000
0','BELGIUM'
2920 DATA '0301000001203003000
0','HOLLAND'
2930 DATA '0000001000020010100
1','BULGARIA'
2940 DATA '0300000000302001000
0','NORWAY'
2950 DATA '0011000000000203010
0','POLAND'
2960 DATA '0000000100010020310
1','ROMANIA'
2970 DATA '0000000000301302010
0','SWEDEN'
2980 DATA '0000001000010030210
0','TURKEY'
2990 DATA '0010000100000111120
0','U.S.S.R.'
3000 DATA '1001010010000000002
0','SWITZERLAND'
3010 DATA '1000001110010010000
2','YUGOSLAVIA'
3020 DEFine PROCedure map(c)
3030   SELect ON c
3040     =1:austria
3050     =2:britain
3060     =3:czech
3070     =4:germany
3080     =5:spain
3090     =6:france
3100     =7:greece
3110     =8:hungary
3120     =9:italy
3130     =10:belgium
3140     =11:holland
3150     =12:bulgaria
3160     =13:norway
3170     =14:poland
3180     =15:romania
3190     =16:sweden
3200     =17:turkey
3210     =18:ussr
3220     =19:switz
3230     =20:yugo
3240   END SELect
3250 END DEFine
3260 DEFine PROCedure europe
3270   SCALE 30,-10,35
3280   PAPER 1,5
3290   CLS
3300   INK 5:LINE -3,55 TO 6,5
9,1,53 TO 5,53,0,51 TO 3,51,0,
51 TO 0,49,-6,50 TO -7,44
3310   LINE 0,40 TO 14,42,18,4
0 TO 21,38
3320   LINE 29,45 TO 31,42,17,
54 TO 16,56
3330   LINE 6,58 TO 6,53:ARC 6
,53 TO 12,59,-1
3340   LINE 35,40 TO 35,45,22,
59 TO 17,61
3350   FOR c=2,5,6,10,11,4,19,
9,1,3,14,8,20,7,15,12,17,13,16
,18:chart c
3360 END DEFine
3370 DEFine PROCedure austria
3380   LINE 10,47 TO 13,47 TO
13,49 TO 17,49 TO 17,48 TO 16,
46 TO 10,46 TO 10,47
3390   CURSOR 14,49,0,4
3400 END DEFine
3410 DEFine PROCedure britain
3420   LINE -6,50 TO -3,54 TO
-5,55 TO -4,58 TO -2,58 TO -2,
56 TO 1,53 TO 0,51 TO -6,50
3430   FILL fil:LINE -10,51 TO
 -9,55 TO -6,55 TO -7,52 TO -1
0,51
3440   CURSOR -2,54,0,3
3450 END DEFine
3460 DEFine PROCedure czech
3470   LINE 13,49 TO 12,50 TO
15,51 TO 22,49 TO 22,48 TO 17,
48 TO 17,49 TO 13,49
3480   CURSOR 18,50,0,3
3490 END DEFine
3500 DEFine PROCedure germany
3510   LINE 7,47 TO 8,49 TO 6,
50 TO 6,51 TO 7,54 TO 10,57 TO
 11,55 TO 14,54 TO 15,51 TO 12
,50 TO 13,49 TO 13,47 TO 10,47
 TO 7,47
3520   CURSOR 9,52,0,0
3530 END DEFine
3540 DEFine PROCedure spain
3550   LINE -9,37 TO -8,44 TO
-2,44 TO 3,43 TO -2,37 TO -6,3
6 TO -9,37
3560   CURSOR -5,42,0,4
3570 END DEFine
3580 DEFine PROCedure france
3590   LINE -2,44 TO -2,46 TO
-5,49 TO 2,50 TO 6,50 TO 8,49
TO 7,47 TO 6,46 TO 8,44 TO 3,4
3 TO -2,44
3600   CURSOR 2,48,0,0
3610 END DEFine
3620 DEFine PROCedure greece
3630   LINE 20,40 TO 23,41 TO
26,42 TO 25,41 TO 22,40 TO 24,
38 TO 22,35 TO 20,40
3640   CURSOR 21,39,5,3
3650 END DEFine
3660 DEFine PROCedure hungary
3670   LINE 16,46 TO 17,48 TO
22,48 TO 23,48 TO 21,45 TO 18,
45 TO 16,46
3680   CURSOR 18,48,4,4
3690 END DEFine
3700 DEFine PROCedure italy
3710   LINE 8,44 TO 6,46 TO 10
,46 TO 13,46 TO 14,45 TO 12,44
 TO 18,40 TO 15,37 TO 15,40 TO
 10,44 TO 8,44
3720   CURSOR 10,46,2,3
3730 END DEFine
3740 DEFine PROCedure belgium
3750   LINE 2,50 TO 4,51 TO 6,
51 TO 6,50 TO 2,50
3760   CURSOR 4,52,0,3
3770 END DEFine
3780 DEFine PROCedure holland
3790   LINE 4,51 TO 5,53 TO 7,
54 TO 6,51 TO 4,51
3800   CURSOR 5,53,0,0
3810 END DEFine
3820 DEFine PROCedure bulgaria
3830   LINE 23,41 TO 23,44 TO
29,44 TO 28,42 TO 26,42 TO 23,
41
3840   CURSOR 24,44,0,2
3850 END DEFine
3860 DEFine PROCedure norway
3870   LINE 6,58 TO 6,62 TO 20
,70 TO 21,69 TO 15,66 TO 11,59
 TO 6,58
3880   CURSOR 8,62,0,0
3890 END DEFine
3900 DEFine PROCedure poland
3910   LINE 15,51 TO 14,54 TO
20,55 TO 23,55 TO 24,50 TO 22,
49 TO 15,51
3920   CURSOR 19,54,0,5
3930 END DEFine
3940 DEFine PROCedure romania
3950   LINE 23,44 TO 21,45 TO
23,48 TO 27,48 TO 30,45 TO 29,
44 TO 23,44
3960   CURSOR 25,47,0,2
3970 END DEFine
3980 DEFine PROCedure sweden
3990   LINE 11,59 TO 15,66 TO
21,69 TO  24,66 TO 17,61 TO 16
,56 TO 13,55 TO 11,59
4000   CURSOR 13,60,5,0
4010 END DEFine
4020 DEFine PROCedure turkey
4030   LINE 25,41 TO 26,42 TO
28,42 TO 42,42 TO  45,37 TO 36
,36 TO 27,37 TO 25,41
4040   CURSOR 31,40,0,0
4050 END DEFine
4060 DEFine PROCedure ussr
4070   LINE 42,42 TO 37,44 TO
34,44 TO 31,45 TO 30,45 TO 27,
48 TO 23,48 TO 22,48 TO 22,49
TO 24,50 TO 23,55 TO 20,55 TO
22,59 TO 28,59 TO 28,60 TO 22,
60  TO 22,62 TO 25,65 TO  24,6
6 TO 20,70 TO 50,70 TO 45,37 T
O 42,42
4080   CURSOR 30,55,0,0
4090 END DEFine
4100 DEFine PROCedure switz
4110   LINE 6,46 TO 7,47 TO 10
,47 TO 10,46 TO 6,46
4120   CURSOR 8,48,0,4
4130 END DEFine
4140 DEFine PROCedure yugo
4150   LINE 14,45 TO 13,46 TO
16,46 TO 18,45 TO 21,45 TO 23,
44 TO 23,41 TO 20,40 TO 19,42
TO 14,45
4160   CURSOR 19,45,0,4
4170 END DEFine
```

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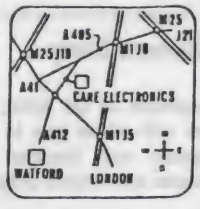

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MICRODRIVE

THE PROGRAMS

F.1 = Monitor Mode
F.2 = TV Mode

1. Giles Todd — B F.2 — **DIY Assembler** — £5

Featured in the March to June 1985 issues of *QL User,* this complete two-pass assembler will assemble all 68008 code and support the assembler directives DRG, END, EQU, DC and DS.

---

2. Richard Cross — A + O — **Mini Monitor** — £3

Using approximately 3K of RAM, this utility multi-tasks on your QL, leaving plenty of room for other programs. Commands include dumping registers, memory and ASCII machine code trace, register store, memory move, memory store — byte, word and long — and jumps. *QL User,* October 1985.

---

4. Shergold & Tose — B F.2 — **Golf** — £2

With up to 50 courses of varying difficulty, lakes, rivers, bunkers and trees. You decide the power and direction of each stroke, striving for a birdie, eagle or even an albatross. Your scorecard may be saved. *QL User,* May 1985.

---

5. Williams & Holliday — A + O — **Paladin** — £5

Written completely in machine code, this excellent *Space Invaders* game was the basis of our games programming series, started in April 1985.

---

7. Steve Deary — B — **Pacman** — £1

Almost 20 screens of increasing difficulty, including an invisible maze, make it a very versatile rendition of the arcade favourite. *QL User,* March 1985.

---

8. Andy Carmichael — B — **Family Tree** — £3

An Archive program and database for setting-up and displaying large family trees. See Theory of Relativity, *QL User,* July and August 1985.

---

9. James Lucy — L — **Composer** — £3

Completed in *QL User,* October 1985, this QLiberated program will allow you to compose play and edit music. The program will handle sharps, vary tempo, and specify staccato and legato playing styles.

---

17. Tony Quinn — S — **CAD QL** — £4

CAD design programs are particularly suited to the QL. This version includes rubber-banding and a user-definable symbol library. *QL World,* September 1988.

---

19. Karl Jeffrey — M + B — **Starport 2001** — £3

Fast machine code action in this version of the *Galaxians* arcade game. *QL World,* November 1986.

---

24. J F Tydeman — S — **Design 3D** — £4

3D screen designs with the minimum of fuss and aggravation. *QL World,* March/April 1987.

---

25. D Carmona — B F.1 — **Stellaris** — £4

This is an extensive real-time space adventure game against the computer, including economic simulations, lunar landing and superb graphics. *QL World,* June 1987.

---

29. Peter Etheridge — B — **Bridge** — £4

An excellent version of this popular card game. Features include accurate computer bidding, automatic or manual play, replay hands, correct scoring, save and load positions and more.

---

32. Phillip Sproston — B — **Advent2** — £4

SuperBasic arcade adventure with a humorous slant. A variety of rooms, robots and problems will keep you on your toes. Full instructions included.

---

33. Leslie Fahidy — B F.2 — **Clock** — £3

This is a complete version of the clock program, described in the June and July 1987 issues of our QL Education series. an on-screen clock can be used to set or read the time.

---

34. E Bamber — F.2 — **QL Converson/ Calculator** — £2

Weights and measures units, conventions and reverse Polish calculation, this utility will convert almost anything to anything. Completely menu-driven, it is very easy to use.

---

35. John Wakefield — B — **Qwhist** — £3

Designed for one player (south) who partners a computer hand (north) against the computerised east and west opponents. *QL World,* August 1987.

---

36. Stanley Sykes — B F.2 — **Mail Merge** — £1

This cartridge contains very handy utilities providing a mail merge and labeller for Quill files. Includes a demonstration.

---

37. P G Ives — B F.2 — **The Double** — £4

A large strategy game in which you manage a football team through four league divisions; features buying and selling, team line-up, morale, and so on, through the league and F.A. Cup season. Includes full instructions.

EXCHANGE

READY TO RUN SOFTWARE

KEY						
	B	=	SuperBasic	A+B+O	=	Assembler and Basic Loader and Object Code
	A+O	=	Assembler and Object Code	S	=	Supercharged
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A Spanish/English version of the traditional gambling game; includes the Leigh Pattern, a system to break the bank. *QL World*, September 1987.

41. Leslie Fahidy — B — Money — £2

An educational shopping expedition, calculating prices from shopping lists and trying to determine what coins you will receive as change.

42. Neil Davidson — A + B + O F.2 — Life — £2

A machine code version of the classic simulation of a colony of living cells which survive, reproduce or die according to mathematical rules. Quill instructions included.

43. Alan Glassbrook — S — Ian Swinton Qsquidge — £2

An arcade hunt through an 8x8 grid expandable series of rooms for the nine parts of Squidge's rocket. *QL World*, October 1987.

44. David March — B — Compress — £2

Utility to compress SuperBasic program files into a more compact form without losing the structure of the program.

45. Ronnie Davidson — M + B — SuperBreakout — £2

A fast machine code version of the classic wall game where, using a bat and ball, you must try to break through the wall of bricks. Optional double bats and/or balls.

46. Norman Marks — B — Navigator — £2

To calculate the distance and direction for travel between longitude and latitude positions on the Earth. The program includes an expandable list of locations. The calculation formulae can be seen from within the program.

47. Richard Clements — B — 3D Maze — £2

Chase round the generated maze, shown in three dimensions, searching for the key to the next level before going through the exit. Extra points can be gained by passing over Point Squares but do not be carried away because it is all against the clock.

48. Jason Price — B — Yahtzee — £2

The popular dice game. On-screen graphics make the two-player program enjoyable and easy to use. *QL World*, November 1987.

50 Jay Lewington — B — Bank — £4

A menu-driven program to keep track of a number of bank accounts, including credits and debits, dated standing orders, printed statements and more.

51. A Didcock — B — Perspective — £1

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52. Simon Quinn — M + B — Space Pods — £3

A machine code arcade game. Your lone ship must protect six central energy pods against marauding aliens. *QL World*, December 1987.

THE ALL-NEW MICRODRIVE EXCHANGE

Microdrive Exchange has always been a popular feature of *Sinclair QL World* and in our constant efforts to improve the magazine we are expanding the Exchange to bring you even more quality programs at budget prices.

To achieve those results we have altered the format of the Exchange. Rather than calculating the number of sectors required by each program and sending the appropriate number of cartridges, we have now made it a one-program, one-cartridge system. So if you would like, say four programs, then regardless of length you will need four cartridges.

There are a number of advantages to the system. First, the service will be much faster, because programs can be copied in advance. Second, rather than having to ensure having the article for documentation we will be able to supply Quill documents on the Microdrive, if needed for future programs.

Finally, for all new programs on the Exchange, rather than just receiving the machine code version, the Supercharged version or whatever, we will be able to supply assembly listings, hex loaders and original Super Basic versions on the same cartridge, so that you can look at and amend programs.

Naturally this service will require the transfer of more than the usual number of Microdrives but bear in mind that the number of Microdrives you send will be returned with the software. We have reduced the price of Microdrives to £2 per cartridge.

With the new system, we have started to include programs which have not necessarily been featured in the magazine, either because they were too long or because we already had too many listings. Consequently we are now looking for quality programs of any length to feature in Microdrive Exchange. If you have any programs which you feel are good enough please send them for review.

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53. S M Walker B **Graphic Writer** £2

A graphic design program. In addition to the usual design commands, your picture can be saved as a series of SuperBasic commands for use in programs. *QL World*, December 1987.

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54. L Miles M + B **Zapman F.2** £3

This fast-action, machine code game is of the classic *Pacman* genre. Variable skill levels and a wide variety of maze formats will keep your interest high.

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55. Alan Pemberton B **Adventure Playtime** £3

An extensive adventure where you must complete tasks for the inhabitants of a strange and unusual land. A Quill document gives details of the possible commands and some help in the form of a series of coded messages.

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56. Paul Mckinnon M **Space Invaders** £3

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57. Timo Salmi B **Spelled** £3

A complete spelling checker. The system works on Quill—lis files, checking them against its dictionary of more than 7,500 words. The dictionary can be expanded automatically as new words are found. This program requires a 512K expansion and occupies two Microdrive cartridges.

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58. Nigel Ford B **Radar** £2

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59. Geoffrey Evelyn B **Dungeons** £4

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60. William Henderson B **Speed Mind** £3

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61. A. Quigly M **Compander** £1

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62. Adrian Steen B F.2 **Dominoes** £2

This version of the classic English dominoes game is to play against the computer. For all ages. *QL World*, May 1988.

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63. I Humphreys B **Vicious Viper** £3

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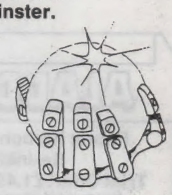

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